The Royal Institution of Great Britain, 1840-1873

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ABSTRACT

The Royal Institution is generally thought of as an institution devoted solely to scientific research and the popular exposition of science. In the mid-nineteenth century however it had a wider range of objectives and activities, and should be considered within the framework of the organisation of learning and culture as a whole, of which science was still an integral part. In the 1840s it acted as an authority on practical science; it provided both specialised scientific education and what was then termed useful knowledge; it supported experimental scientific research; and it was a literary and philosophical society of an eighteenth-century type, devoted to the cultivation of humane learning in general. As the unity of learning disintegrated, the R.I. was forced to reassess its activities and decide which ought to be its most important function. Formal educative activities were reluctantly abandoned. From the early 1850s and more enthusiastically in the 1860s, scientific research was recognized to be its prime function. At the same time its management passed for the first time into the hands of scientific men and any possibility of support from outside interests warded off by a new insistence that research at the Institution must be purely disinterested and independent. Paradoxically however, its non-scientific activities received greater attention than ever before, which may be linked to changes in the Institution's membership and to ideas of cultivated entertainment. These developments made the 1860s not only a "golden age" of success and popularity, but the decisive decade in fixing the activities and ethos of the Institution for the next hundred years.

Contents

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INTRODUCTION

The Royal Institution of Great Britain was founded in 1799, and one hundred and seventy years later it is still a flourishing institution. Advanced scientific research is pursued in its laboratories, and science is expounded to a variety of people in its lecture theatre. Devoted as it is to scientific research on the one hand, and to the popular exposition of science on the other, the Institution is quite naturally thought of as a scientific institution, albeit in form and organisation one of a most unusual type. Yet in the mid-nineteenth century, notwithstanding the immense contributions made in its laboratory to scientific knowledge, the R.I. was hardly a scientific institution in the sense in which we understand the term today. Indeed, a main conclusion of the present study is that in many ways it was a very unscientific institution. Previous studies of its history (with the notable exception of Dr. Berman's work which will be referred to again shortly) have confirmed the familiar characterisation of the R.I. as a scientific institution, and have been written predominantly in terms of the scientific discoveries of a series of great men working in its laboratory.[1] Yet despite this emphasis upon its scientific character, the Institution has been seen as notably untouched by developments in the organisation of science and as an oddity which survived only by virtue of the achievements of its research scientists. Such an interpretation of its past is scarcely sufficient to explain its remarkable survival as a public institution supported solely by its Members' subscriptions, still thriving today in the same magnificent premises in Albemarle Street.

(1) Most of the works that include reference to the R.I. rely on Thomas Martin, <u>The Royal Institution</u> (1942, 3rd ed. rev. 1961). Martin was Secretary of the R.I. from 1929 to 1950, and his brief history is chiefly concerned with the scientific achievements of the Institution's professors.

The scientists who worked at the R.I. might indeed be the figures most in the public eye, but they were not always the most influential people in the management, or even the key figures in directing the Institution's future course. Faraday was always the loyal servant of the Board of Managers, and never sought to be more. His successor, John Tyndall, was quite excluded from taking any part in the formal management for the first twelve years of his working life at the R.I., a time during which many of the most important developments of the period occurred. It is essential therefore to look first and foremost more closely at the Managers of the Institution, not only by examining a few especially important and influential men, but also by analysing the composition of the whole Board of Managers over the period under discussion, for without an understanding of changes that occurred in this respect it is impossible to explain satisfactorily the developments of these years with regard to the advancement of scientific research. In addition, the larger body of the Members of the Institution is equally worthy of attention. These have been hitherto quite neglected or dismissed as fashionable upper-class people, a view which throws little light on their reasons for supporting the Institution. Then as now, no public institution dependent on membership subscriptions for the major portion of its income could afford to ignore its members, since survival was always a matter of maintaining a constant level of subscriptions and of encouraging as many new people as possible to join the Institution.

The tastes and demands of the membership were very relevant to the second of the two purposes usually attributed to the Institution, the popular exposition of science. In reality this phrase is a misleading one as far as much of the nineteenth century is concerned and easily leads to underestimation of the importance of this type of institution in the cultural life of the period. Recent studies of learned and literary and philosophical societies using prosopographical methods to construct a collective biography of all their members and supporters, have demonstrated that science was then something in which a great variety of people participated, and that such institutions provided an important entree to organised culture and learning.(1) It is a different question to consider whether the R.I. was in reality a populariser of science. In twentieth century terms one might justifiably consider it to have been precisely that, but the definition does not correspond to the state of affairs in the mid-nineteenth century without considerable qualification. At that time the R.I. did not consider itself to be a populariser, although the line it trod between the popular and the expert was always a delicately judged one. It was only then for the first time that a need for popularisation was beginning to become apparent, since not until a subject had become too complicated or too technical to be understood by the majority of educated people did it need to be simplified sufficiently or put into ordinary language in order to be generally intelligible. Although the term "popular" was frequently used in the mid-nineteenth century, it normally referred at that time to work, generally of an inferior kind, which set out simply to court the favour of the mass of the people (with whom the R.I. was not at all concerned) rather than seeking approbation from the intelligent and educated classes.(2) Once again, then, the emphasis on the R.I.'s role in the popular exposition of science is part of the picture painted by historians in the twentieth century, which is appropriate only to a later period of the Institution's history, but which seems to have been used as a convenient description and explanation of all the R.I.'s activities that could not properly be called scientific research.

The truth is that the Institution had a far more varied range of

(1) Steven Shapin and Arnold Thrackray, 'Prosopography as a Research Tool in the History of Science: The British Scientific Community 1700-1900', History of Science, xii (March 1974), 1-28.

(2) R. Williams, Keywords: A vocabulary of Culture and Society (1976), s.n. 'Popular', p.199. See also Sir James Murray (ed.) A New English Dictionary (1884-1928), VII.ii.1125 (this work will be subsequently cited as Murray, N.E.D.).

objectives and activities than is generally realised. As a result, its history concerns wider issues than those of purely scientific history, and while it provides valuable insights into the development of scientific organisations, it also reveals many other important aspects of life in the mid-nineteenth century. Two themes in particular constantly recur while working on the middle decades of the nineteenth century, the period of the Institution's history under consideration here. The first is the importance of understanding certain key terms such as "literature", "philosophy", but above all "science", because a range of different meanings were currently as well as subsequently attached to the same word. This has certainly served to confuse later historians, if not men living at the time in question, since the mid-nineteenth century was a period when there was perhaps the greatest number of different meanings concurrently available, and when changes in the sense of words expressed vital shifts in the concepts that underlay them.(1) An awareness of the confusion liable to arise from the number of different meanings, as well as an interest in the origins of words, may perhaps be reflected in the continuing popularity of such works on words and their meanings as those by the Rev. Richard Chevenix Trench, later Archbishop of Dublin.(2) The second is the importance of remembering that generally speaking the world of learning was a unified one at least until the 1870s. This immediately puts institutions concerned with learning in a quite different perspective. The R.I. was indeed primarily a scientific institution, but it should be emphasized that it always had, and continued to have, a very substantial non-scientific side to its activities. If one ceases to consider it as purely a scientific institution and no longer allots it a

(1) The importance of studying words in this way is briefly discussed by R. Williams, op.cit., 'Introduction', pp.11-15.
(2) Richard Chevenix Trench (1807-1886), cleric and philologist; for details of his life see Dictionary of National Biography (hereafter cited as D.N.B.). His most popular philological works were The Study of Words (1851), which ran to twenty-one editions by 1890, and A Select Glossary of English Words used formerly in senses different from their present (1859).

place in the history of the development of scientific institutions alone, the Institution has then to be considered within a broader context altogether, that of the framework of the organisation of learning and culture as a whole, of which science was a part, but only a part. Viewed in this context the antecedents of the R.I. are clear. Its forbears were those gentlemen's literary and philosophical societies which sprang up all over Europe and the eastern seaboard of North America in the wake of the Enlightenment. So long as culture and learning remained broadly unified, and science was an integral part of that unified learning, it is anachronistic to regard the history of such institutions as the R.I. as relevant only to the progress of scientific discovery or the development of scientific organisation. Not indeed until towards the end of the nineteenth century is a "two cultures" interpretation appropriate, for only by that time had scientific learning clearly passed beyond the compass of the cultured educated man.

It was in the period under discussion here, from 1840 to 1873, that the first cracks in this unity of learning began to become visible. It was then that the seeds of modern development germinated in all fields of learning alike, not in science alone, and some of the main features must be picked out in order to elucidate the background to this period of the R.I.'s history. To begin with, during this period science itself became a far more complex affair altogether, both with regard to institutional organisation and in terms of the sheer accumulation of knowledge, and consequently its position as a part of the general structure of culture and learning becomes more difficult to assess. This is well exemplified by the fact just mentioned that the word "science" was then in the process of acquiring a number of different meanings, all of which were used concurrently. It is essential to distinguish between these meanings; not only because "science" was used to refer to quite different things, there was thus the maximum amount of confusion possible as to the purposes and proper activities of those institutions concerned with science, but also because different kinds of "science" were thought suitable for different social classes, a distinction drawn above all in the mid-century years studied here.

During the course of the nineteenth century the word "science" came to refer only to particular, recognised departments of learning, departments which had formerly been encompassed within "philosophy", with its three branches of moral, metaphysical and natural philosophy.(1) "Natural philosophy", meaning scientific knowledge in general, continued to be used on occasion throughout the century, notably by the R.I. in the designation of its Professorship of Natural Philosophy.(2) But while the word "science" achieved by the end of the century its central modern meaning of the theoretical and methodical study of the natural world,(3) in the mid-nineteenth century the word referred both to very different fields of scientific knowledge, as well as to quite different types of scientific knowledge. Three distinctions are relevant in the present context. The first was "exact knowledge" or "exact science", or what today would be called pure science. This generally referred to studies in the experimental sciences, and presupposed a body of precise knowledge amenable to measurement and subject to the operation of various general laws, then termed the "laws of nature". The definition of these laws and the investigation of their effects in a variety of conditions formed a large part of the original research undertaken in this period. Secondly, "science" also meant applied science or technological knowledge, commonly called "useful knowledge" or "practical science".

(1) For a comprehensive list of the meanings of "philosophy" and "science", see Murray, <u>N.E.D.</u>, VII. ii. 781-2; VIII. ii. 221-2. The coining of the word "scientist" in this period by William Whewell is well-known, but less attention is paid to contemporary meanings of the term "science".
(2) This designation was used until 1961 (<u>Record of the Royal Institution</u> (1968), p.26).
(3) R. Williams, <u>op.cit.</u>, s.n. 'Science', pp.233-4.

"Useful knowledge" embraced on the one hand the application of scientific knowledge to a particular craft or industry, such as (to cite a favourite example) the application of the principles of chemistry to dyeing and the production of textiles; and on the other, the utilitarian practice of applying scientific principles and knowledge to problems of social welfare, as in the improvement of urban sanitary conditions. Science in its application to health and social welfare was just as important as science in its application to industry and to the production of wealth, and both were termed "useful". Lastly, there was a large body of knowledge which was called "science" in the mid-nineteenth century, but which would no longer be so called today without qualification. Indeed, the Rev. A. Hume, author of a guide to learned societies in the mid-century, commented on the confusion caused by the "modern and extended use of the term 'science' ... for we apply it now to almost any subject which is or may be followed out upon fixed principles".(1) Many of these subjects were only beginning in this period to be organised on systematic lines. This was the case with statistics, so beloved by the utilitarians as the instrument which provided them with "exact" information capable of being analysed, and hence of yielding a potential solution to the problems of the day. It was equally the case with the new sciences of man such as philology, anthropology, ethnology, archaeology, economics and sociology, all fields where amateurs abounded and the level of knowledge was still thoroughly understandable to the layman, but where systematic methods of observation and analysis were gradually being applied to increasingly specialised subjects.(2) In this area the term "scientific" frequently

(1) Rev. A. Hume, The Learned Societies and Printing Clubs of the United Kingdom (1853), p.47.

(2) No general study exists of the human sciences in the nineteenth century, but much helpful information may be found in J.W. Burrow, Evolution and Society: A Study in Victorian Social Theory (1970), and 'The Uses of Philology in Victorian England', in R. Robson (ed.), Ideas and Institutions of Victorian Britain: Essays in honour of George Kitson Clark (1967). See also, M.J. Cullen, The Statistical Movement in Early Victorian Britain: The Foundations of Empirical Social Research (1975).

meant no more than "systematic".

As the century progressed these three types of scientific knowledge became more clearly differentiated, not only from each other, but also from what had formerly been considered learning as a whole. Hitherto science had been an integral part of the cultured knowledge of an educated gentleman, undistinguished from the rest of that learning except by the term "philosophical" as opposed to "literary". By the end of the nineteenth century, science was clearly isolated as something quite different from general learning and the liberal education of a gentleman, and moreover, the different sciences were even becoming mutually incomprehensible to each other. This was due largely to increased specialisation within each branch of science, one result of which was the creation of separate technical vocabularies, a process which may be observed as early as 1850 in the complaint of an eminent geologist, Sir Roderick Murchison, on a chemical paper read at the Royal Society:

> The paper on the alkaline bases, by Dr. Hofmann, astonished me and proved to me (an old pupil of Brande and Faraday) that I was incapable of understanding the elements and phraseology of the science as it is now carried on ... the <u>isomerism</u> of ammonia, in which all the ammonia escapes, puzzles me sorely. It is another world of science. (1)

This may be an unusually early example, but it shows that the need for popularisation became very real as time went on, for if scientists themselves were puzzled, how much more so was the layman.

The development of specialised scientific learning comprehensible only to specialists was all part of the much-studied process of professionalization, a process which had obvious consequences for institutional

(1) Murchison to A. Sedgwick, 18 Jan 1850 (A. Geikie, <u>The Life of Sir Roderick Murchison</u> (1875), ii. 106). Murchison evidently completely misunderstood the terms used, as his sentence about isomerism makes no sense as it stands, a fact which only emphasizes the problems created by the use of new technical vocabularies; "isomerism" is a description referring to different substances which both have identical percentage composition and molecular weight, but in which the atoms are arranged differently.

organisation as well as for scholarship and learning. The trend from the general to the specialised was very marked in the newly founded institutions of the nineteenth century. From the early years of the century many learned societies were founded specifically to promote knowledge in one particular field alone.(1) These new learned societies were very different from the older literary and philosophical societies, although the term "learned society" continued to be applied indiscriminately to a wide variety of bodies, more or less learned as the case might be. At the same time, a new concern with the technological and applied uses of science was to be found in the educational institutions established at this time, as seen in the professorships of the engineering sciences established in University and King's College in London, or in the heavily practical direction of the courses in the Government School of Mines, founded in 1851, and generally known by its later title as the Royal School of Mines.(2) Education provided under the aegis of newly-established professional institutes was also naturally directed towards a study of the applications of science in the relevant area of professional interest, and the School of Pharmacy set up by the Pharmaceutical Society in 1842 is a good example.(3) From the mid-century a further new feature in the organisation of science was the involvement of the Government. The State first became concerned with scientific education as something imperative

(1) See the list compiled by Hume, op.cit., pp.xv-xix, which includes Scottish and Irish foundations as well as London and provincial societies.

(2) D.S.L. Cardwell, The Organisation of Science in England (rev.ed., 1972), pp.46-7, 86-7; see also W.G. Armytage, A Social History of Engineering (1970), pp.149-52, for a brief discussion of the beginning of professional training for engineers; M. Reeks, Register of the Associates and Old Students of the Royal School of Mines and History of the School (1920), pp.49-50, outlines the early purposes of the school and lists the first professors. The University of Durham, founded in 1833, also provided courses in engineering, but they attracted few students and were transferred to Newcastle in the 1870s (C.E. Whiting, The University of Durham 1832-1932 (1932), pp.80-2, 108, 117).

(3) M.P. Earles, 'The Pharmacy Schools of the Nineteenth Century', in F.N.L. Poynter (ed.), The Evolution of Pharmacy in Britain (1965), pp.79-95.

for securing future economic prosperity, and once an initial commitment was made, this could only increase inexorably as time passed. The setting up in 1853 of the Department of Science and Art formalised this new involvement,(1) and the Department controlled the only entirely state-supported institution for advanced scientific education, the Royal School of Mines, which absorbed the previously independent Royal College of Chemistry in 1853. Until the 1870s, however, the State's attitude to scientific research, as opposed to scientific education, remained one of aristocratic patronage(2), rather than viewing it as an investment in future economic prosperity, and it was in this spirit that in 1849 the State began for the first time to provide a small but regular contribution towards the cost of scientific research by making an annual grant of £1000, distributed under the auspices of the Royal Society.(3)

By the end of the nineteenth century, scientific research had become an activity which was pursued in university laboratories, in Government institutes such as the National Physical Laboratory (1900), or in the laboratories of industrial companies, although the latter were still very few in number. Higher scientific education was provided by the universities, and vocational training in the new polytechnics and professional schools. In some of these institutions both research and teaching might be carried on (although the two had not always been considered compatible), but none offered the pleasures and facilities of a learned society as well. By the end of the century then the R.I. had become unique. It remained resolutely unspecialised, both in the nature of its activities,

(1) The early history of the D.S.A. has been studied by C. Duke, The Department of Science and Art: Policies and Administration to 1864 (unpublished Ph.D. thesis, London, 1966).
(2) A good example of this kind of patronage was the Government grant in 1844 of £500 to Edward Forbes, the naturalist, to aid the publication of his Aegean researches (G. Wilson and A. Geikie, Memoir of Edward Forbes (1861), p.364).
(3) R. M. Macleod, 'The Royal Society and the Government Grant: Notes on the Administration of Scientific Research, 1849-1914', Historical Journal, xiv.2 (1971), 323-58.

and in the type of scientific knowledge it embraced. It continued to be concerned with a wide range of science and to maintain a multiplicity of functions. It is easy to regard the Institution as something which had always been remote from the main pattern of developments in the organisation of science. This is not so, and indeed the isolation of the R.I. can be dated quite precisely to the beginning of the 1870s.

Equally there were similar developments in the other half of the world of learning in this period. The R.I. was always a "literary" as well as a "philosophical" society, and during this period the term "literature" also underwent an evolution of meaning. Hitherto the world of "literature", or "letters", had referred broadly to the world of learning,(1) and indeed the frequently used phrase "science and literature" appears to have been thought of rather as a hyphenated word, as embracing two aspects of a single thing, ~~not~~ than as referring to two distinct fields of learning. By the end of the nineteenth century the world of literature was very different from what it had been at the beginning; as in the case of "science", "literature" was gradually differentiated from general learning. In the mid-century the literary world was still predominantly an amateur world, but the trend from the general to the specialised can be seen here too in a similar, though not so striking, increase in learned societies in this field, such as the Royal Society of Literature (1823), or with such different areas of interest as the Royal Asiatic Society (1824), the Numismatic Society (1836), or the Syro-Egyptian Society (1844).(2) Likewise many printing clubs and publishing societies were founded between 1830 and 1850, with a further

(1) Murray, N.E.D., VI.i.342-3.
(2) Hume, op.cit., pp.xv-xvi.

series of foundations in the 1860s and 1870s.(1) The increase in activity as such subjects became truly learned (many of the later foundations derived their scholarly tradition largely from Germany), was reflected in their incorporation into the university curriculum. For example, history entered the Honours School in Oxford for the first time in 1850; London University had professors of English Language and Literature from its foundation, and the rise of English studies at Cambridge has been well chronicled by E.M. Tillyard.(2) Outside the universities, the most notable development was the fact that although from the end of the 1850s an ever-increasing number of new periodicals appeared challenging the hitherto undisputed authority of the old established reviews, the Edinburgh and the Quarterly, and covered all facets of political, artistic and intellectual life, nonetheless science became less and less frequently included in their coverage. The Saturday Review for example dropped science as a topic of serious interest in the early 1860s.(3) Partly this was because scientific periodicals showed an equally vigorous increase; but above all, it was symptomatic of the gradual removal of science from general culture and polite learning.(4) By

(1) Ibid., pp.xx; H.R. Steeves, Learned Societies and English Literary Scholarship in Great Britain and the United States (1913), chaps.v-vi. The early nineteenth century was characterised by what Steeves calls a "wave of bibliomania" and the foundation of small exclusive book clubs, such as the Roxburghe in 1812. Many of the societies founded in the 1830s were a protest against the exclusiveness of the early book clubs. The revival in literary society activity dates from 1864 with the foundation of the Early English Text Society (ibid., p.156).
(2) E.M. Tillyard, The Muse Unchained (1958). The University College professorship of "English Language and Rhetoric" became "English Language and Literature" in 1852 (H.H. Bellot, University College, London: 1826-1926 (1929), Appendix 'Faculty of Arts'); King's College, London, had a chair of English Literature and History, but left it vacant, dividing its duties between the Professors of classics and mathematics, until 1835 with the appointment of the Rev. Thomas Dale (F.J.C. Hearnshaw, The Centenary History of King's College, London: 1828-1928 (1929), pp.89, 106).
(3) M.M. Bevington, The Saturday Review, 1855-1868 (1941), chap.x.
(4) Several scientific, or mainly scientific, periodicals were started in the 1860s but foundered soon afterwards, such as the Reader (1863-1866). This periodical had a literary department, but its successor, Nature, did not. Steeves also points out that there were no special journals for literary scholarship before the mid-century, and that

the end of the century this literary activity was even sufficient to support a new class, the professional man of letters who made a living entirely by writing for the periodicals, as opposed to the man of letters in the old tradition, for whom literary composition was but one part of his general cultural activity.(1) In the 1850s and 1860s, however, there was another important group for whom literary composition was more than just a pleasant pastime, namely, the "intellectual aristocracy", who filled the upper ranks of the professions and played such a large part in political, literary and academic life.(2) Their interests were of particular relevance to the R.I. in these mid-Victorian years, for it will be shown that many of these men joined the R.I., or at least came to listen to lectures there. It should be remembered too that many scientists were themselves part of the intellectual aristocracy, and moved in the same social circle. Not surprisingly therefore, this was a group in society where any division between science and literature did not make itself apparent until some time after it had occurred elsewhere.

It remains to indicate more precisely what kind of institution the R.I. was in these mid-century decades, but first of all, a word on sources is appropriate here. This study focuses first and foremost on the Royal Institution itself as an organisation, as a corporate entity, and therefore makes no apology for concentrating on a relatively narrow range of sources, the principal ones being the Institutional records themselves. These records form the bedrock upon which this study rests. Reliance upon such sources may be criticised on the grounds that these

the journals of such bodies as the Society of Antiquaries and the British Archeological Association often contained many literary articles (op.cit., p.131), another point which reflects the lack of division between science and literature in the first half of the century.

(1) J. Gross, The Rise and Fall of the Man of Letters: Aspects of English Literary Life since 1800 (1969), chaps. ii-iii, discuss inter alia the increased tempo of journalism from the 1850s, the new crop of periodicals, and the status of the professional reviewer.

(2) N.G. Annan, 'The Intellectual Aristocracy', in J.H. Plumb (ed.) Studies in Social History, a tribute to G.M. Trevelyan (1955), pp.243-87.

records bear the stamp of officialdom and can only present a very one-sided picture. Yet the ear soon becomes attuned to the nuances of the official language of the minute books, and there are other types of evidence to place alongside the formal records of the Institution's Managers, in the shape of informal records such as correspondence, notebooks and journals, as well as sources external to the Institution and comparative evidence from similar bodies. Furthermore, both the range and volume of Institutional sources become far greater from the mid-1840s, a fact that was due largely to the administrative re-organisation carried out at that time, and so much fuller evidence is available on many aspects of the Institution's activities.(1) But more important, it is possible to examine the contrast between the official stance as seen through the formal records of the Managers with the more varied picture as seen through the informal sources which relate to the activities that were an everyday part of the Institution's life. There was, as is so often the case in periods of institutional change, a substantial difference between the declared aims of the Institution and the actual activities that were carried on within its walls, and it was from the tension generated between the two that the most important developments of the period emerged. How these changes came about is a subject of as much interest as what the changes in question were, for the study of any institution must try to answer the question not only of why, but also of how it developed as it did.

The present study of the Institution is limited to the middle decades of the nineteenth century, 1840 to 1873, since the recent work of Dr. Berman has already provided a valuable re-interpretation of the nature and importance of the Institution in the early nineteenth

(1) For example, from this time proper ledgers are available containing details of all the Members' annual subscriptions, of all the tickets bought for all Courses of lectures, and of books purchased for the Library.

century.[1] A brief outline of the chief characteristics of the earlier history is clearly an essential prelude, and here I rely heavily on Dr. Berman's work. Towards the end of the eighteenth century, as the complex of cultural and learned activities associated with the Enlightenment reached England, science gained renewed prominence in a changing set of values held by the improving landed aristocracy. In 1799 the Royal Institution was founded by a group of these improving landowners, stimulated by the efforts of an emigre American of scientific interests, Benjamin Thompson, Count Rumford (1753-1814).[2] The Royal Charter, granted a year later in 1800, and quoted at frequent intervals ever since, stated that the Institution was intended to be:

> a Public Institution for diffusing the knowledge, and facilitating the general introduction of useful mechanical inventions and improvements; and for teaching by courses of philosophical lectures and experiments, the application of science to the common purposes of life. (3)

This statement has served more to mislead than to give a true description either of the reasons behind the R.I.'s foundation or of the principal activities it undertook in its early years. Dr. Berman has shown how very important were the "needs and aspirations" of the landed aristocracy involved in the Institution's foundation, needs which concerned the economic benefits it was hoped would flow from the application of science, especially to agriculture, as well as the social benefits embodied in ideas of rural philanthropy current at that period.[4] Enlightened aristocratic landlords formed a majority of the management

(1) M. Berman, Social Change and Scientific Organisation: The Royal Institution 1799-1810 (unpublished Ph.D. thesis, John Hopkins University, 1971), a copy of which may be found at the R.I. For a briefer discussion, see M. Berman, 'The Early Years of the Royal Institution, 1799-1810: A Re-evaluation', Science Studies, ii (1972), 204-40.
(2) On Rumford see D.N.B., and Berman, op.cit., chap.iii.
(3) Charter of the Royal Institution of Great Britain, 13 Jan 1800 ('The Charter, Acts of Parliament and Endowments of the Royal Institution of Great Britain and Supplemental Charter', p.1, booklet published by the R.I. (1965), hereafter cited as 'The Charter &c.', booklet).
(4) Berman, loc.cit., p.217.

of the Institution and soon directed its activities towards their interests. The man engaged as Professor of Chemistry in 1802 is renowned in history as an experimental chemist of great talent, and this was Humphrey Davy (1778-1829). Dr. Berman has shown that Davy was obliged to curtail his early experimental interests in galvanism and pneumatic chemistry, in order to concentrate his researches on such problems of applied science as tanning and agricultural chemistry.(1) From 1803 to 1818 he was a member of the Board of Agriculture, a body controlled by the landed interest and intended to foster scientific husbandry among landowners. Davy indeed soon became an able publicist for the cause of applied science, emphasizing its utility and its economic benefits, and it was his skill in advocating these views that endeared him to the enlightened aristocracy. Science thus ceased to be regarded only as polite learning, but in a revival of its Baconian orientation towards applied science, was put to applied use in "an entrepreneurial context".(2) However, the Royal Institution failed to survive as the private enterprise of a small group devoted to putting into practice these Baconian principles, and in 1810 the R.I. was forced by financial strains to dismember its hereditary proprietorial structure and become a properly public institution supported by its Members' annual subscriptions. Dr. Berman's more recent work has continued to trace the development of the Institution through the three subsequent decades under the impact of utilitarian ideas of the applications of science.(3) Until the mid-1820s the landed interest continued to dominate the management, when

(1) Ibid., pp.217-28.
(2) Ibid., p.232.
(3) Dr. Berman's work is in course of preparation, but brief details may be found in his 'Introductions' to the facsimile edition of the Managers' Minutes (The Archives of the Royal Institution of Great Britain in facsimile; Minutes of Managers' Meetings, 1799-1900 (1972-), hereafter cited as 'Introduction', Man.Min.). At the time of writing, volumes I-V covering the period up to 1814 have been published, but I am grateful to Dr. Berman both for allowing me to see his 'Introductions' to vols.VI-VIII, and for his many helpful suggestions.

it then for the first time became outnumbered by men from the professions. The influence of Davy's successor, William Thomas Brande (1788-1866),[1] appointed Professor of Chemistry in 1813, proved to be of great significance, as he turned the focus of the Institution's activities from investigating the uses of science in agriculture, the interest of landed proprietors, to concern with those uses of science in medicine and social welfare which so exercised the medical profession and the utilitarian reformers of the period.

It is clear then that the R.I. was very far from being only the research institution and centre of popular exposition that it is often depicted to have been. In the mid-nineteenth century the R.I. may be analysed as a combination of four elements. Firstly, the Institution acted as an authority on science in its practical applications. This had always been one of its main objectives, although the way it was put into practice changed, from the early establishment of a museum of technological devices for exhibiting those "useful mechanical inventions and improvements" specified by the Charter, to a more generalised role as a place where the practical applications of science were discussed and exhibited in its lecture theatre.[2] In addition, the Institution's Professors had always and continued to be called upon to act as professional experts in the increasingly numerous and varied questions concerning the practical applications of science, making laboratory investigations when necessary in the process. In the 1820s the R.I. laboratory was open for analyses not only for its Members, but also for official bodies or indeed for any other interested party. At that time, W.T. Brande, the R.I.'s principal Professor, was recognised as London's leading scientific expert, and a large part of his time was concerned with giving expert

(1) W.T. Brande, see <u>D.N.B.</u>, and below pp.64-5.
(2) See below, chap.4.

advice on a wide range of scientific matters.[1] Under Brande's direction, Michael Faraday (1791-1867), who was to prove himself to be the most gifted natural philosopher of his time, spent his early years at the R.I. as what can best be described as an industrial consulting chemist. Although Faraday indeed abandoned paid analytical work in the 1830s, he too became increasingly in demand as a scientific expert, since it was felt that science could hold the solution to all kinds of problem, and that in any event, the best way to investigate such problems was to call in a "scientific" expert. The men turned to for scientific expertise prove to have been the leading experimental scientists of the day, for until trained, salaried professional men became available, eminent scientists were called upon to fill the same type of role as Chadwick's poor law inspector or medical officer of health. Faraday's work for the Government and other public bodies such as Trinity House reached a peak in the 1850s, as the volume of his own original research began to decline.

Secondly, the R.I. was a place of scientific education. In 1840 this was of two types. In the first place it provided a scientific education for medical students at St. George's Hospital, as one result of Brande's involvement in the medical world.[2] But it was also concerned with more general scientific education and with the "diffusion of useful knowledge", and here the R.I. had perennial difficulties in deciding what was the proper kind of subject and the right level of treatment for the audience which filled its lecture theatre. It continued to feel strongly that it should not merely provide useful knowledge at an elementary level, but also that, having achieved a reputation as a "school of chemistry" under Brande's influence, it should "teach the principles of Inductive and

(1) D.N.B., and information supplied by Dr. Berman.
(2) See below, pp.124, 137-41.

Experimental Science" and also "afford Opportunities for Study".(1) These aims indeed seem more appropriate to a college or university than to a literary and philosophical society. Its educative function as a whole changed substantially in the period under review as other institutions were founded specifically to provide formal scientific education. The activities associated with the "diffusion of useful knowledge", formerly considered as the expression of serious aims with regard to education and the communication of scientific knowledge, became more clearly what was termed at the time "rational entertainment". It was always difficult for the Institution to reconcile the useful or informative aspect of these activities with their less serious function of providing a form of entertainment and recreation, and from this viewpoint the R.I. presents a unique case of changing fashions and facilities in the use of leisure.

Thirdly, the R.I. was an institution for fundamental scientific research, an area where its substantial achievements go a long way towards explaining why this has been the most enduring and well-known feature of its history. Yet in truth this was only one of the Institution's functions, albeit an important one. Davy had established a reputation for research, although he himself had been obliged to direct his work primarily towards practical questions. In 1813, the young bookbinder's apprentice, Michael Faraday, joined the R.I. as Davy's laboratory assistant, and remained there under Brande.(2) For as long as Brande remained in control of the laboratory's activities, the volume of Faraday's own research was necessarily small. During the 1820s however Faraday gradually established

(1) R.I. MSS, 'Prospectus' (1852), p.iii (bound in volume of 'Membership Lists' (1851-54) with the Visitors' Annual Report for 1851; see also p.149, n.2).
(2) Shortly after his engagement, Davy made a lengthy European tour from 1813 to 1815, taking Faraday with him. Faraday was then re-engaged by the R.I. on his return. He did not become "Superintendent of the House and Laboratory in the absence of Mr. Brande", who by that time no longer resided at the R.I., until May 1821 (Managers' Meeting Minutes, VI.328 (21 May 1821); these Minutes are subsequently cited as Man.Min.).

himself as the essential prop of the Institution, notably by displaying an unsuspected gift for brilliant lecturing, and it was Faraday's decision to concentrate on his own research after 1829 that resulted in the redirection of the laboratory from practical analyses to experimental research, a decision sealed by the success and renown accompanying his momentous discovery of electro-magnetic induction in 1831. Applied science and attention to practical questions were never totally excluded while Faraday lived, and his life exhibited in many ways a constant tension between the demands of practical questions and the needs of pure research work; but from the 1830s onwards, at least the major part of work done in the laboratory concerned original research in the pure sciences. Yet it is vital to remember that scientific research was not a function originally included among the objectives of the Institution in its Charter, and not indeed until 1851 did it even enter the official list of the Institution's objectives.(1)

Finally, the R.I. was a learned society, but a learned society of the eighteenth century cultural kind, such as the Society of Antiquaries or the Society of Dilettanti, quite unlike the new specialised learned society of the 1840s. It was a place where cultivated interests which had little to do with science could be pursued, and where for example, varied topics which had nothing at all to do with science were to be found on the lecture programme, and where over two-thirds of the Library consisted of books on what would today definitely be classed as non-scientific subjects.(2) Furthermore, one should not forget another side of any learned society, its purely social role as a meeting place and as a centre of amusement and relaxation for educated people, for in a learned society of a general kind there is an active focus for culture in its social context. The cultural role deserves attention, especially in a period

(1) See below, p.149.
(2) See below, chap.5, passim.

when participation in the activities of learned societies was an important part of the social life of many people. In addition, learned societies had more immediate uses of a quite different nature, as a ladder and a means of social advancement for the humbler members of the professions, especially those people in the new professions that were struggling to gain professional recognition, and whose social and professional status in this particular period was extremely ambiguous, a question that has relevance to the R.I.'s membership.(1)

The R.I. thus aspired to fulfil four very different functions. In the mid-nineteenth century its chief problem was to decide which ought to be the most important function of the kind of institution that it had become, and then to define the form that this should take. Clearly this was not an easy matter for an institution as rich in variety and as complex as the R.I. One may perhaps best understand the developments of the period as creating a kind of palimpsest effect, where traces of the old were left still clearly visible, contemporary changes freshly overlaid and future developments foreshadowed. Today the Institution is still such a palimpsest, but it was the events of the years between 1840 and 1873 that determined which layer of the palimpsest should remain uppermost for the next century, and perhaps beyond. In these years one may trace the effects of the Institution's dual lineage from the ideas of the Enlightenment and the theories of the utilitarians. The aristocratic tradition of the patronage of learning, together with enlightened ideas of the economic benefits of science, encouraged the Institution's pursuit of research; utilitarian notions of the benefits of applied science engendered increasing demands for analyses and practical investigation. Both strands of thought, aristocratic and utilitarian, deemed it right and proper to contribute to the movement for the diffusion of useful knowledge, although they might disagree about the best approach; and the flourishing activities

(1) See below, pp. 112-17.

of the R.I. as a literary and philosophical society testify to the vitality of this form of organisation in the cultural life of the period.

Opinions on the relative importance of each of the Institution's functions naturally varied, partly on account of the people involved in the management, their age and background, and partly because of changes in the type of person who supported the Institution as a Member. One may trace a series of turning points, and at moments there were distinct clashes over what was felt to be the most important objective. The main question concerned the R.I.'s educational role, and was first posed in 1843 by a plan to establish a school of practical chemistry in the Institution, which if implemented, would almost certainly have turned the main thrust of the Institution's energies towards education, resulting very probably in it becoming a part of the developing network of educational institutions.(1) This was rejected, as was a second attempt in the latter part of that decade to provide more advanced scientific education.(2) Scientific education provided specifically for medical students finally disappeared after 1853. At the same time, experimental research was first asserted to be the Institution's most important activity, and in the 1860s, under the direction of the R.I.'s new Secretary, Dr. Henry Bence Jones,(3) research was officially pronounced to be the first and essential objective, so much so that if the Institution did not continue to produce important results in the laboratory, its continued existence was held to be in danger. The Institution thus identified itself for the first time during these years with the ideal of scientific research, and its laboratories devoted to this end became its conscious raison d'etre. At the same time, the R.I.'s role as an authority on practical science diminished, partly on account of differences in personality and outlook between Faraday and

(1) See below, pp.125-36.
(2) See below, pp.141-48.
(3) Dr. Henry Bence Jones (1813-1873), D.N.B., and below, pp.41-3.

his successor, John Tyndall, and partly because other sources of expertise became available. It continued too to thrive as a gentleman's philosophical society on the old model, of which today one may still find at the R.I. many reminders, the best perhaps the spacious building itself in Albemarle Street. Indeed, the R.I. must now be the only place where research laboratories are still discreetly hidden within the elegant apartments of a literary and philosophical society.

By the early 1870s the purposes of the Institution and its chief characteristics for the next forty years, and arguably for the next century, had been ineradicably fixed. In opposition to the general trend, the Institution remained unspecialised and independent, supported only by private patronage and occasional endowments. It had moreover defined scientific research and the men who should undertake such work, in such a way as to reject any possibility of aid by Government, academic or commercial interests. For scientific research to be totally a privately supported affair was certainly strange by the end of the nineteenth century, and by that time the Institution was quite unique, the more so since it depended on one man alone, the resident professor, for the maintenance of the research effort. There were indeed other professors, but except for a short period in the 1860s, the R.I. showed little tendency to develop into what one historian has called "a sort of university of research supported by private munificence".(1) That had to wait until the twentieth century when following the endowment in 1896 of the Davy-Faraday Research Laboratory by Dr. Ludwig Mond, Sir William Bragg was able in the years after the First World War to set up a team of scientific investigators.(2) During the mid-nineteenth century, as the R.I. in a

(1) S.G. Checkland, The Rise of Industrial Society in England 1815-1885 (1964), p.90.
(2) Martin, op.cit., pp.57, 61. Mond (1839-1909) was a chemical technologist and industrialist; Sir William Bragg (1862-1942), was Fullerian Professor of Chemistry at the R.I. from 1923 to 1942, and best known for his work on the analysis of crystal structure by means of X-rays (see D.N.B. on both men).

sense lost its former function as an integral part of that utilitarian world where applied science and education were the predominant concerns, research had, almost inadvertently through the genius of Faraday, come to be the prime scientific function of the Institution. Nonetheless, research was never conceived to be the Institution's only function, and had therefore to co-exist with the R.I.'s other activities. The result was a compromise, and one that time has proved to be a viable working compromise. Yet because "science" was seen as the pursuit of knowledge not for any immediate practical purpose, but purely for its own sake alone, scientific research at the R.I. remained reminiscent of the gentleman amateur, the solitary devotee of an earlier age, supported by the patronage of a literary and philosophical society. How this came about in a world which was moving rapidly towards professional organisation with ever-increasing State support, is a phenomenon all the more extraordinary because it was so successful. In these decades the Institution showed a great ability to adapt to new demands and changed circumstances, but old traditions and conceptions of learning persisted with a vitality which was remarkable.

Chapter 1

Management and Organisation

In the mid-nineteenth century the character of the R.I. was thus a complex one, and it was in these years that its objectives underwent critically significant changes. The way in which these changes came about will be discussed in detail in Chapters 3-5, but in this chapter and the next, the Managers and the Members of the Institution will be analysed, and first of all that important body of men, the Managers. For in small organisations at least, individuals do undoubtedly play a decisive role in their development, no matter what other outside pressures and influences may also be present. It is therefore essential to analyse the type of man who became a Manager, and to elucidate the general changes in the composition of the management over this crucial mid-nineteenth century period, both in order to understand the character of the R.I., and to establish a basis from which to see how the Institution's objectives changed. Furthermore, some discussion of the administrative organisation of the Institution is necessary here, for important steps were taken during the period under discussion to re-organise the administrative structure into a coherent unitary form.(1) This achievement was of fundamental importance, since only if the management had an efficient set of administrative tools at their disposal, could they attain the ends desired by the revision of the Institution's objectives.

The management of the Institution consisted of three Officers - President, Treasurer and Secretary - and two boards of fifteen members each, the Board of Managers and the Board of Visitors. Together they constituted the controlling body of the Institution. In practice however the function of the Board of Visitors was purely advisory, limited to

(1) See below, pp.71-82.

inspecting the state of repair of the premises, auditing the accounts and drawing up the Annual Report and Accounts. Discussion of the Visitors can therefore be confined to their use as a recruitment pool for future Managers. There is one other element which it would be unrealistic to omit from this discussion of the Management - the Professors.[1] The Professors were indeed the salaried servants of the Institution, in contrast to the Officers, Managers and Visitors, whose positions were purely honorary. But the Professors were always present at the official Managers' Meetings unless detained by other business, and the resident Professor held the position of Superintendent of the House, a position in which he was closely in touch with the Secretary and involved in most aspects of the management of the Institution's affairs. The Professors' views were naturally of considerable importance in the changes that occurred during this period.

The relative importance of the Officers inevitably varied at different times with different individuals. It is therefore appropriate to discuss first the chief Officers, assessing their relative weight at different times, before discussing changes in the general body of the Managers.

The coping-stone of the Management structure was the President. Between 1842 and 1865, the President was Algernon Percy, fourth Duke of Northumberland (1792-1865).[2] The Duke was a man of wide interests, a notable patron of antiquarian scholarship, and fondly remembered by the Royal National Lifeboat Institution for his work in bringing the self-righting lifeboat into use.[3] He was also renowned for the feudal

(1) See Appendix I for the Professors' dates of appointment and positions held.
(2) Northumberland succeeded his brother as 4th Duke in 1847. Before that date his title was Lord Prudhoe, and I have referred to him by that title until his succession to the dukedom.
(3) See D.N.B. for details of his life, membership of learned societies, and patronage of learning, in particular by bearing the expense of Edward William Lane's enormous Arabic Lexicon (1st vol. published 1863). For his contribution to the life-boat service, see O.H.M. Warner, The life-boat service: a history of the Royal National Life-boat Institution, 1824-1974 (1974), pp.21, 42.

splendour in which he presided over the extravagantly restored Alnwick Castle, and as an improving landlord and builder of many churches, bridges and roads. Since he had both literary and technological interests, Northumberland was a thoroughly suitable President for the R.I., as the eleventh Duke of Somerset (a mathematician of some note) had been before him.(1) He did not take part in the everyday management of the Institution, but intervened only on occasions when important changes were under discussion, or when the principle of the Managers' authority and control was in question. He was thus not a guiding force, but a man who valued the Institution as the workshop of Faraday (whom he greatly admired), and who was personally well aware of how much useful and intelligent entertainment could be provided by a well illustrated lecture, as his frequent presence at the regular Friday Evening Meetings testified.(2) During his latter years as President, Northumberland came less often to the R.I., and he attended only one Managers' Meeting between 1858 and 1865.(3) He wished to resign the Presidency in 1858,(4) and again in 1861, presumably for reasons of absenteeism and age, but was persuaded to remain. As Faraday pleaded:

> Is it essential to <u>yourself</u> that we should lose you? You are kind, you bear with us, you do not disturb our management, you justify it when submitted to you, you do all that we desire. No one can be to us the President that you are. (5)

(1) Edward Adolphus Seymour, 11th Duke of Somerset (1775-1855), President of the R.I. from 1827 to 1842; see <u>D.N.B.</u>

(2) For example, Northumberland took the chair at ten out of twenty-one Friday Evening Meetings in 1851. The chairman was always listed in the <u>Proceedings of the Royal Institution</u> (hereafter cited as <u>P.R.I.</u>) before the abstract of the lecture. This lecture was called a Discourse, and throughout this thesis the term Discourse refers exclusively to lectures given at the Friday Evening Meetings.

(3) In May 1862, on the occasion of the election of the Fullerian Professor of Physiology, which took place once every three years (Man.Min., XI.428 (14 May 1862).

(4) Faraday to Northumberland, 10 Feb 1858, in Henry Bence Jones, <u>The Life and Letters of Faraday</u> (1870), ii.400-1 (hereafter cited as Bence Jones, <u>Faraday</u>).

(5) Faraday to Northumberland, 15 Nov 1861, in L. Pearce Williams (ed.), <u>The Selected Correspondence of Michael Faraday</u> (1971), ii.1007 (hereafter cited as Williams, <u>Selected Correspondence</u>).

In other words, as Faraday made clear with such charm, Northumberland was a figurehead, as indeed one would expect, and did not interfere with the Managers.

On Northumberland's death it was suggested that Faraday might be appointed President.(1) This would indeed have been a departure from the established tradition of an aristocratic President and Faraday was wise to refuse on grounds of his failing health and mental powers. It was a medical man who succeeded Northumberland in 1865, Sir Henry Holland, Bt. (1788-1873). On Holland's death in 1873 the Presidency reverted to the Dukes of Northumberland and was to stay in the Percy family until 1945.(2) Holland's brief interregnum between 1865 and 1873 was the only break in the long succession of aristocratic Presidents, and one which calls for some explanation. He was naturally a gentleman of impeccable background, and a fashionable and successful physician, who had been created a baronet in 1853.(3) But in 1865 he was seventy-seven years old (succeeding a man of seventy-three years), a man of the Regency and the great days of Holland House, a survivor of the Whig era of the 1820s and 1830s, whose circle and whose scientific friends had been formed in the early decades of the nineteenth century. To some he appeared an eccentric figure, famous for his swift and distant travels, and for his invariable presence at the sickbed of any figure of note.(4) His interests covered both the cultured tastes of a gentleman, and the professional demands of new "scientific" medicine as practised in the mid-century. On the one hand, he was a dedicated reader of the ancient

(1) D.N.B., in the article on Faraday which was written by John Tyndall.
(2) Presidents of the R.I.: 6th Duke of Northumberland 1873-1899, 7th Duke of Northumberland 1899-1918, 8th Duke of Northumberland 1918-1930, Lord Eustace Percy 1930-1945 (Record of the Royal Institution (1968), p.24).
(3) Information from D.N.B., Burke's Peerage & Baronetage, Sir Henry Holland, Recollections of Past Life (1872), passim, and William Munk (ed.), Roll of the Royal College of Physicians, iii.144-9 (hereafter cited as Munk's Roll).
(4) See the generally hostile obituary in The Lancet, 1 Nov 1873, p.650.

classics and of French and German literature, but equally he made some not unperceptive contributions to medical science.(1) Articles from his pen on both literary and medical topics were published in the Quarterly and the Edinburgh.(2) From his complaint against the "present extravagant multiplication of societies and institutions of every kind dividing and subdividing all the concerns of human life",(3) it is probable that he enjoyed the R.I. for its non-specialised and cultured atmosphere, while also having a comparatively forward-looking view of the needs of scientific research. For he was certainly interested in this last, and from 1859, while still only a Manager, he made an annual donation of £40 for the purchase of scientific apparatus.(4) This was no doubt a contributory factor to his election to the Presidency, which must otherwise be ascribed to the increasingly professional and scientific composition of the Board of Managers. Holland co-operated closely with the Secretary, Dr. Henry Bence Jones, the man who was to be responsible for the shift in emphasis at the R.I. towards research, and he was moreover the only President to take an active part in the management, rarely missing a Managers' Meeting.(5) Holland formed therefore a

(1) Holland, op.cit., pp.285-9. Holland's medical works were Medical Notes and Reflections (1839), Chapters on Mental Physiology (1852), which included some of the essays in Medical Notes. He does not wholly deserve to be dismissed as "a fashionable and successful (if not highly scientific) physician" by W.L. Burn, The Age of Equipoise (1964), p.26, n.3.
(2) W.E. Houghton (ed.), The Wellesley Index to Victorian Periodicals 1824-1900 lists nine articles by him in the Quarterly Review between 1846-54, ten articles in the Edinburgh Review between 1857-73, and one article in Bentley's Quarterly Review in October 1859 (i.943, ii.952; hereafter cited as the Wellesley Index). Most of these articles were collected and published together in Essays on Scientific and other Subjects contributed to the Edinburgh and Quarterly Reviews (1862).
(3) Holland, op.cit., p.259.
(4) In 1863 this became the basis of the Donation Fund for the promotion of scientific research. See below, p.164.
(5) As a Manager re-elected ten times between 1854-65, Holland attended on average three-quarters of the Managers' Meetings, and when elected President, he never missed more than one meeting a year (Man.Min., XI-XII, passim).

notable contrast to both his predecessor and successor, for although his cultural interests might be similar, the nature of his personal involvement in the world of science and in the R.I. was wholly different.

The Presidency thus provided an epitome of the transformation of society, as the aristocratic and the "compleat man" of the Enlightenment was replaced by the professional man and the scientist. The Treasurership epitomises precisely the same contrast, but in an even more marked form. From 1832 to 1849 the Treasurership was held by William Richard Hamilton (1777-1859), the antiquary and diplomat, who was an example of the man so often found in the earlier nineteenth century, the much-travelled literary man and patron of learning who found science a natural part of his wide interests. "A man of recognised taste in art and sound criticism",(1) Hamilton's chief interests were classical and Egyptian antiquities. After he left the diplomatic service his many commitments are witness to the breadth of his learning, showing the range of learned societies to which he gave much time and energy: Treasurer of the Royal Institution between 1832 and 1849; a founder of the Royal Geographical Society in 1833, and its President from 1837 to 1839 and again from 1841 to 1843; a trustee of the British Museum from 1838 to 1858; Secretary to the Dilettanti Society for close on thirty years; a regular Council member of the Society of Antiquaries until 1849; a fellow of the Royal Society - and no doubt this is not an exhaustive list.(2) In 1849 when he was seventy-two, this characteristic early nineteenth century figure was succeeded by a somewhat dissimilar figure, William Pole (1798-1884).(3)

(1) D.N.B.
(2) Information from D.N.B.; H.R. Mill, The Record of the Royal Geographical Society, 1830-1930 (1930), pp.38-9; Joan Evans, A History of the Society of Antiquaries (1956), pp.242, 246. L. Cust, History of the Society of Dilettanti (1898), pp.172-3, 183-4.
(3) Not to be confused as he was by F. Boase, Modern English Biography (1892), iii.1570, with William Pole (1814-1900), Professor of Civil Engineering at University College, London, and an authority on whist. (This reference work will be subsequently cited as Boase.)

Pole was a "gentleman conversant in the Science of Chemistry and in several branches of Natural Knowledge",(1) but more importantly, a professional man from the law, a conveyancer and equity draftsman, of whom little more is known except that he fulfilled his duties at the R.I. in faithful and meticulous fashion. In 1865 Pole in turn was succeeded by a far more dissimilar figure - William Spottiswoode (1825-1883), a mathematician and physicist of considerable stature, an accomplished linguist, a lecturer and writer, who also continued to manage the family printing business of Spottiswoode & Co.(2) President of the Royal Society between 1878 and 1883, Treasurer of the Royal Institution until 1873 and afterwards its Secretary from 1873 to 1879, Spottiswoode was a key figure in the organisation of science through his involvement in all the principal scientific societies. At one point he was simultaneously Treasurer of the Royal Society, the British Association for the Advancement of Science and the Royal Institution, and was responsible therefore for the finances of the two most important scientific pressure groups and the best known of the non-specialised societies.(3) Nor did he neglect the newer specialised societies, for he was also concerned with the Mathematical, Geographical and Astronomical Societies.(4)

It was however the Secretary who was the cornerstone of the day-to-day running of the Institution, and it was the Secretary's attitude

(1) Pole's description on his certificate for election to the Royal Society (Archives of the Royal Society of London, 'Certificates', vol.vii (1820-1830)). He was the second son of a family of minor gentry in Gloucestershire (Burke's Peerage and Baronetage (Van Notten Pole baronetcy)).
(2) D.N.B., and The Spottiswoode Collection of Physical Apparatus (booklet, 1899), which contains a memoir reprinted from Nature, 26 Apr 1883, and an obituary from The Times, 28 June 1883.
(3) He was Treasurer of the Royal Society 1871-78, of the British Association 1861-74, and of the R.I. 1865-73.
(4) He was Secretary of the Royal Geographical Society 1862-63, and President of the London Mathematical Society 1870-72; he was a Fellow of the Royal Astronomical Society, but contributed only one paper to the Society. (The Spottiswoode Collection of Physical Apparatus, p.8; H.R. Mill, op.cit., p.66; Monthly Notices of the Royal Astronomical Society, xliv (1883-4), 150-3.)

which decisively set the tone and style of the management. It is noteworthy that all the men who filled this key post were professional men, and moreover lived close at hand in London all the year round. Edmund Daniell (d.1854), a lawyer and brother of J.F. Daniell (Professor of Chemistry, King's College, London), who was Secretary from 1826 to 1842, barely enters the period under discussion here,(1) and his successor, the historian and miscellaneous writer, S.R. Maitland (1792-1866), held the position only temporarily for two months.(2) But in January 1843 with the appointment of the Rev. John Barlow the R.I. acquired one of the two Secretaries who were to prove a decisive influence in its affairs in this critical period.

The Rev. John Barlow (1799-1869) held the position of Secretary for seventeen years from 1843 to 1860. He has been an unduly neglected figure, unremembered in the history of the R.I. except in a portrait of extremely poor quality by H.W. Pickersgill.(3) One probable cause for this relegation to obscurity was that he was overshadowed by his successor as Secretary, Dr. Henry Bence Jones, as W.F. Pollock (the distinguished barrister and man of letters) implied when he wrote that "Barlow has not had justice done to him".(4) Barlow's career indeed proves on investigation to have been an interesting and significant one. He came from a family of minor gentry with no claim to fame until the previous generation when two uncles achieved success in the Navy and in India.(5) The son of a parson and the eldest of five, Barlow took holy orders after completing his education at Trinity College, Cambridge.(6) In

(1) Daniell resigned in November 1842 on his appointment as a Commissioner in the Court of Bankruptcy, Birmingham (Man.Min., IX. 231 (2 Nov 1842)).
(2) See <u>D.N.B.</u> for details of Maitland's life and many works. Maitland did not stand for election as Secretary, and Barlow was elected in January 1843 (Man.Min. IX. 24 (16 Jan 1843)).
(3) Painted in 1858; in the possession of the R.I.
(4) W.F. Pollock, <u>Personal Remembrances</u> (1887), i. 243.
(5) See <u>D.N.B.</u> for Sir Robert Barlow (1757-1843), admiral, and Sir George Hilaro Barlow (1762-1846), governor-general.
(6) Barlow's father was Thomas William Barlow (1760-1821), vicar of Halberton in Devon 1799-1820, and a prebendary of Bristol 1797-1821. His brothers were Thomas Wootton (1800-1874) cleric, Philip Bockett

1822 he became curate of the parish of Uckfield, Sussex, and from 1830 he was the rector of Little Bowden, Northamptonshire. After 1830 however his career centred on the metropolis, and he either owned a house in London, or at least rented one for the London season.(1) He became a Member of the R.I. in 1832, a Visitor in 1836 and 1837, and a Manager for the first time in 1838.(2) He became an F.R.S. in 1834, at a time when election still depended on the right sponsor and not on scientific achievement, and from 1837 to 1838 served as Secretary to the Zoological Society. He took an active interest in science and in 1838 published a work on physiology, The Discovery of the Vital Principle, or Physiology of Man. In 1842 and 1843, the period of change-over in the Secretaryship, he published two more books, the first on physiology, and the second On Man's Power over himself to prevent or control Insanity. The latter proved to be extremely popular, and it ran to three editions.(3) Furthermore, in December 1842 he handed over his Northamptonshire parish to his younger brother, who conveniently appears to have already been the curate there.(4) For a period beteen 1843 and 1850, it seems reasonable to assume from the complete absence of any evidence to the contrary, that Barlow held no clerical post.(5) By 1851 however he was Minister

(1804-1858) barrister, and George Hilaro (1806-1866) senior physician at Guy's Hospital from 1842 and a medical author. A sister, Catherine, never married, and of the brothers only George Hilaro had any children (Burke's Peerage & Baronetage (1882) (Barlow of Fort William baronetcy), Foster's Baronetage (1883), J.A. Venn, comp. Alumni Cantabrigienses, II.i.156, Law List (1851), Munk's Roll, iv.28-9).

(1) Details taken from the London Post Office Directories of the period, Robson's Directory and Court Guide and Boyle's Court Guide. No mention of Barlow appears in any London Directory before 1830.
(2) R.I. MSS,'Membership List', for the years cited.
(3) Published in 1843 & 1849 by William Pickering (Small Books on Great Subjects, no.3), and in 1860, translated into Dutch with additions and explanations by Dr. T. Kroon (Zutphen, 1860).
(4) Rev. H.I. Longden, Northamptonshire and Rutland Clergy from 1500 (1938), i. 193.
(5) Barlow does not appear in the Clergy List or the Royal Kalendar covering the period 1843-50 under any position in the Royal Household or as the incumbent of any parish within ten miles of the City of London.

of the Duke Street Chapel, and from 1854 to 1869 he held the appointment of chaplain-in-ordinary at Kensington Palace.(1)

The interest of these details of Barlow's career lies in their close relationship to the R.I. Apart from the Royal Society, the R.I. appears to have been the only scientific society to which Barlow belonged, and the only society in whose management he was involved, with the exception of an earlier brief period (from 1837 to 1838) as Secretary of the Zoological Society.(2) Not for Barlow the new specialised scientific society. He was indeed devoted to the R.I., but the character of his attachment warrants examination. Certainly he was genuinely interested in science and an admirer of Faraday. His works on physiology and insanity were very favourably received,(3) and indeed according to a recent survey of the subject by Vieda Skultans, Barlow's work on insanity was one of the fullest expressions of ideas current at that time on the importance of moral management in the treatment of the insane, as opposed to coercive measures.(4) Barlow advocated the encouragement of self-control, the strengthening of the will by discipline and moderation. These were ideas which not only had a profound effect on the treatment of the insane, but were also closely connected with the prevailing philosophy of individualism and embedded in the cultural climate of the time.(5)

(1) In the Directories of 1848-50 nobody is listed as minister of the Duke Street Chapel, so that it is reasonable to suppose that Barlow was given this position in 1851. His identity is confirmed by W.F. Pollock, who refers to Barlow's position there (op.cit., i. 243). Barlow's appointment to Kensington Palace appears in all the relevant Directories and biographical dictionaries.
(2) P. Chalmers Mitchell, Centenary History of the Zoological Society of London (1929), p.68.
(3) See for example the reviews in the British & Foreign Medical Review XV (1843), 535-6, and XVII (1843), 245-6.
(4) Vieda Skultans, Madness and Morals: Ideas on Insanity in the Nineteenth Century (1975), p.12.
(5) Madness was considered to be a moral problem, and one that concerned all mankind. The approach was subjective, and characteristically "Barlow's book is offered as a practical manual outlining strategies of self-help in cases of derangement" (ibid., p.14).

Why then did Barlow abandon such a promising subject, in which he was making a considerable reputation, so soon after becoming Secretary of the R.I.? For although he gave a Friday Evening Discourse in 1843 "On Man's Power of controlling or preventing the Manifestation of Insanity in himself", he never again referred to this subject.(1) Between 1844 and 1857 he gave nine Friday Evening Discourses and two afternoon Courses of Lectures. These concerned solely the practical applications of science viewed in the normal utilitarian manner, and one may cite as typical examples his Discourses "On the Chemical and Mechanical processes and the social influences of the Penny Post" (1844), "On Mr. Phillip's Fire-Annihilator" (1849), and "On the Application of Chemistry to the preservation of Food" (1855).(2) One part of the answer may concern Barlow's apparent conviction of the R.I.'s importance as a centre for the diffusion of useful knowledge. No direct evidence survives, but one may infer that he held these views from his own choice of lecture subject, as well as from his stance in any dispute over the type and style of the lectures to be given at the R.I. Another part of the answer may possibly be found in the nature of his position as Secretary of the R.I. This is indeed speculation, but an examination of the evidence does suggest a connection, especially when one remembers that the 1830s and 1840s were the most favourable decades for those trying to gain acceptance to the best circles.(3) From 1830 Barlow appears to have determined to make his way in London society rather than

(1) R.I. MSS, 'Index to Lectures' (1842-1865), p.10. This volume contains details of speaker, subject and attendance at each Friday evening Meeting in these years.
(2) 'Index to Lectures' (1842-1865), pp.16, 39, 66. Abstracts of Barlow's Discourses after 1851 may be found in the <u>P.R.I.</u>, i.422-5, and ii.72-9, 215-22, 409-13, 506-8. Barlow's two afternoon Courses of Lectures were equally utilitarian in approach, "Some Mechanical Principles and their Practical Application" (1851), and "Physical Principles of the Steam Engine" (1852) ('Index to Lectures' (1841-1912), pp.77, 82).
(3) L. Davidoff, <u>The Best Circles: Women and Society in Victorian England</u> (1873), especially chaps. 1 and 2.

remaining merely a country parson. He moved house in London twice, around 1838 and again in 1845, each time to a better address, ending up in Berkeley Street, Piccadilly.(1) His first essay in scientific society management appears to have borne little fruit, according to the historian of the Zoological Society, who summed up all that is known of that episode:

> I have been unable to ascertain the reason for the election of Barlow as Secretary; the Minutes show little trace of his activities, and he published nothing in the Scientific Proceedings or Transactions. He resigned on account of ill-health and frequent absence from London, and the Council's expression of regret was polite. (2)

The Zoological Society did not however enjoy any social cachet, whereas by contrast the R.I. (and it was in 1838 that Barlow resigned from the Zoological Society and first became a Manager of the R.I.) brought him into friendly contact with people from the very top of Society with whom he would otherwise have been unlikely to mix in view of his lack of aristocratic connections. It also brought him into contact with intellectuals, men of letters, and all the chief scientists of the day.(3) It gave him a circle not only congenial to his tastes, but one useful for social advancement. As Secretary to the R.I., he had a name

(1) London Post Office Directories, and Boyle's Court Guide for the years from 1830 onwards. Berkeley Street was only two streets away from the R.I. in Albemarle Street.
(2) P. Chalmers Mitchell, op.cit., p.68.
(3) For example, a friendly letter of 3 Aug 1847 to Barlow survives from Thomas Babington Macaulay, discussing the latter's defeat in the recent election (R.I. MSS., Barlow's Letter Album, Box XVA; this Letter Album was kept as a collection of autographs, not as a record of R.I. business). Barlow was known to the Carlyles, and was the subject of a witty caricature by Mrs. Carlyle in a letter to her husband of 16 July 1858, portraying him offering "delicate attentions" to a French authoress, but aghast when the latter wished Barlow to introduce her to Carlyle (reprinted in T. Bliss (arr.), Jane Welsh Carlyle: a new selection of her letters (1949), pp. 274-5). W.F. Pollock, the cultured barrister, always referred warmly to Barlow, emphasizing his good services to the R.I. (op.cit., i.242-4). W.R. Grove, the physicist who later became a judge, felt so strongly that Barlow should not be forgotten that he had a bust made of him, and wrote to Spottiswoode on 15 Oct 1874 offering it to the R.I. (R.I. Grove MSS).

and a position that singled him out from other aspirants to social success, for the R.I. undoubtedly had social cachet unlike other similar institutions. The Institution formed the focus around which his social life was built, and his dinners before and gatherings after each Friday Evening Meeting had thus an interest distinguishing them from other people's receptions.(1) He certainly entertained whoever was the lion of the day, and not surprisingly some of his friends were shocked to find Louis Blanc, the radical French politician, at Barlow's in March 1849, at a time when Blanc's national workshops in Paris were at the height of their notoriety.(2)

Thus as Barlow's career progressed, and as the R.I. and the social life built around the Institution claimed more time and energy, his early interests disappeared and he ceased to put any original effort into his scientific work, contenting himself with a careful correlation and exposition of existing knowledge. In an atmosphere of increasing professionalism, he was therefore dismissed as an amateur and quickly forgotten. In 1856, Tyndall, a scientist with advanced German training, summed up Barlow's efforts neatly: "he will be at science and a gulph (sic) appears to separate him from his work. He never seems to come in contact with it, (and) looks helplessly on while others make experiments for him."(3) By the end of the 1850s Barlow leaves behind the impression of a fussy, officious character, a dilettante of science, a picture indeed which forms a considerable contrast to the early 1840s, when his voice was heard with energy and purpose at Managers' Meetings.(4) It was

(1) Pollock, op.cit., i.243, and the Edinburgh Review, cxxxv (Apr 1872), 343, where he especially refers to the "pleasant gatherings" at Barlow's house after the Friday Evening Meetings to which so many R.I. Members adjourned to talk over the lecture.
(2) Diary of A.C. Ramsay, geologist, 23 Mar 1849 (quoted in A. Geikie, Memoir of Sir Arthur Crombie Ramsay (1895), p.146).
(3) R.I. Tyndall MSS, Journal VIa, p.274 (13 Feb 1856).
(4) Barlow's name occurs frequently in the Managers' Minutes in 1842 (the year before he was elected Secretary), and he probably precipitated the resignation of the Duke of Somerset from the Presidency, by giving notice of the difficulty of conducting business due to the continued absence of the President. Somerset resigned the following month (Man.Min., IX.201, 208 (7 Feb and 21 Mar 1842)).

in the 1840s during the earlier years of his secretaryship, that crucial questions concerning the R.I.'s educational role was raised. Barlow was at the centre of decision and while he never acted independently of the Board of Managers, it was Barlow who handled the tricky negotiation of these problems, and ensured that educational activities would not swamp the R.I.'s other functions.

In 1860 this reverend gentleman and amateur of science was replaced by, once again, a quite dissimilar figure, Dr. Henry Bence Jones, a man who was already influential in the Institution's management and who was to become its driving force for the next thirteen years. Bence Jones (1813-1873) was a physician and chemist of the new school who had studied under Thomas Graham, Professor of Chemistry at University College, London, and under Justus Liebig, the German chemist whose laboratory at Giessen was one of the most important European schools for scientific training in the late 1830s and 1840s.(1) Liebig's theories, particularly those on physiology, had a profound influence on the young Bence Jones, appearing as "a new light where all had been confusion and incomprehensible before".(2) From this time onwards Bence Jones directed his work towards the chemical aspects of medicine, and displayed all the eminent mid-Victorian physician's professional interest and enthusiasm for scientific research. By 1850 he had established a reputation as an authority on stomach and renal diseases, before then directing his attention to animal chemistry.(3) His career prospered;

(1) D.N.B., Munk's Roll, iv.40-2, and Henry Bence Jones, An Autobiography, with elucidations at later dates (1929). This last was dictated by Bence Jones shortly before his death in Apr 1873, and the notebook containing the original dictation is now in executor's hands awaiting disposal. This had been lost at some date before 1929, and the text of the booklet is take from a proof drawn some years earlier by Bence Jones's youngest son, who added the elucidations in 1929. Comparison with the original has not been possible, but almost all the information can be confirmed elsewhere.

(2) Bence Jones, An Autobiography, p.16.

(3) For an appreciation of Bence Jones' contributions to animal chemistry and chemical pathology, see N.G. Coley,'Henry Bence Jones, M.D., F.R.S., 1813-1873, Notes and Records of the Royal Society of London, xxviii. I (June 1973), 31-56.

in 1845 he had joined St. George's Hospital, where from 1846 to 1862 he held the position of physician, and was appointed a consulting physician during the last five years of his life from 1868 to 1873. He also managed a large private medical practice, and produced thirty-four scientific papers in addition to several books.(1) In character Bence Jones was generous and enthusiastic, though at times impetuous, but in his attitude to his work he was a complete professional.

In 1849 Bence Jones became a member of the R.I., in 1851 a Visitor, and in 1853 a Manager for the first time. Yet even before his appointment as a Manager, Bence Jones was already active in R.I. affairs, as the person who introduced the young John Tyndall to the R.I. and then played a major part in Tyndall's appointment as Professor of Natural Philosophy in 1853.(2) Such an initiative was typical of the energetic doctor. His activities will be referred to frequently, but two aspects of his Secretaryship deserve especial mention here. Firstly, Bence Jones' relationship to the R.I.'s Professors was wholly different from that of his predecessor. To them he was not only a personal friend, but a fellow-scientist and medical adviser as well, for as physician to Faraday, Tyndall and many of the leading scientists of the day, Bence Jones had a finger both literally and metaphorically on the pulse of the scientific world.(3) Secondly, Bence Jones made the Secretary once more

(1) Catalogue of Scientific Papers, compiled and published by the Royal Society (hereafter cited as R.S.C.S.P.), iii.571-3, lists 34 titles by Bence Jones, and one joint title. He wrote seven medical treatises or textbooks, and two historical works, The Life and Letters of Faraday (1870), and The Royal Institution: its Founders and its First Professors (1871) (Bence Jones, An Autobiography, p.31).
(2) See below, pp. 151-3.
(3) According to his own account, Bence Jones became Faraday's physician around 1849-50 (An Autobiography, p.27). By the end of 1855 he was giving Tyndall medical advice (Tyndall Journal V , pp.228-9 (9 and 10 Dec 1855). Tyndall also records an instance of the usefulness of Bence Jones' position as a medical man in the world of science, on the occasion of the election of a new Treasurer to the Royal Society. Tyndall and his friends wished Spottiswoode to be elected (as he duly was), while General Sabine, President of the Royal Society, wanted J.P. Gassiot as Treasurer; "I urged Bence Jones if he could manage it to see Sabine, and if possible influence him. He went

the dominant influence at the R.I. In the preceding decade, the 1850s, it appears that decisions were largely in the hands of a group of Managers (of whom indeed Bence Jones was one) who were re-elected frequently over many years, and faithfully attended nearly every meeting. Barlow, as Secretary, had by that time become more of an administrative figure, and Faraday, the Resident Professor, was always the loyal servant of the Managers who never questioned their decisions. In Bence Jones' time, however, it appears that the Managers at least dealt with important business efficiently and were not troubled by administrative details, an impression supported by the fact that there were fewer Meetings, attended by fewer Managers, and fewer Committees.(1) Tyndall did not become the Resident Professor until 1867, and indeed took no part at all in the formal administration of the R.I. until 1865.(2) It is therefore not surprising that Bence Jones with his energy and firm ideas came to play the major role in redirecting the Institution's objectives in the 1860s.

By this time a fundamental change had occurred in the general composition of the Board of Managers and Bence Jones was able to find among them firm supporters for his policies. Between 1840 and 1870 the professional element in the management came to outnumber the amateurs decisively.(3) Moreover, this professional element itself came to be

there simply in the guise of a medical man ..." (Tyndall, Journal VIIIa, p.469 (- Oct 1870)). In the mid nineteenth century, scientific physicians such as Bence Jones were not hampered by the demarcation of professional boundaries, and their influence in the affairs of scientific societies deserves fuller recognition.

(1) In the 1840s there were never less than fifteen Managers' Meetings each year, and in 1846 as many as twenty-two. In the 1850s the number of Meetings varied between twelve and seventeen, but in the 1860s was sharply reduced to between eight and thirteen. The number of Managers regularly attending two-thirds or more of the Meetings decreased from ten in the 1840s to eight in the 1860s (Man.Min., IX-XII, passim.).

(2) Tyndall was not invited to attend a Managers' Meeting until March 1865 (Man.Min., XII. 99 (6 Mar 1865)).

(3) See Appendix II.i-iii for all Managers elected between 1840 and 1873.

essentially made up of scientists rather than of representatives of medicine and the law, as had been the case in previous years (see Graph 1).(1) In the 1860s these scientists became quite suddenly the largest single group in the management. Furthermore one may identify among them a particular group of scientists who were regularly re-elected over many years, who attended most of the Managers' Meetings, who manned the Committees, and who formed a "hard core" of Managers in these middle decades of the century. They had their counterparts in non-scientific men who were also regularly re-elected, but in the 1860s it was the scientific men who dominated the management. This was a fundamental change, and one which to a large extent explains the Managers' changing conception of the R.I.'s role.

But first of all what precisely was this "scientific element" in the management? It does not lend itself to simple categorisation, and apart from the professional scientists (Sir Charles Wheatstone, John Hall Gladstone), it included professional men with substantial scientific achievements (W.R. Grove, Charles Brooke, George Busk), military men with scientific interests (General Sabine, Colonel Philip Yorke), utilitarian radicals (J.P. Gassiot), the younger generation of scientists and educationists (Sir Douglas Galton, Sir John Lubbock, J.H. Gladstone again), while not forgetting scientific amateurs (J.C. Moore, J.G. Appold) or aristocratic scientists (Lords Rayleigh and Rosse).(2) It is hardly accurate to describe men as "scientists" in the mid-nineteenth century, partly on account of the slow progress of professionalization

(1) This was the second major change in the composition of the Board of Managers during the nineteenth century. The first had occurred in the mid-1820s when the landed interest became for the first time outnumbered by men from the professions (see Berman, 'Introduction', Man.Min. VII). Men from the aristocracy still continued to be elected, but rarely more than once or twice (see Appendix II.i-iii).

(2) See Appendix II.i-iii, for brief biographical details. With the exception of J.C. Moore, all those mentioned above appear in the D.N.B., and the most active in the R.I. in the period 1840-73 are discussed in the text of this chapter.

Graph 1.


Analysis of Managers 1840-1875
1840
1850
1860
1870
15
Number of Managers
1. Men of Science
10
5
15
2. The Legal Profession
10
5
15
3. The Medical Profession
10
5
1840
1850
1860
1870

in science in these years, and partly on account of the varying definitions of the word "science" itself referred to earlier. The term "scientist" in modern parlance has an over-simple and professional designation, and it is more accurate to use the term "man of science", which, with its early nineteenth century, non-specialist connotation, can better express the range of activities both within and without science that many of these men followed. It is evident that in the period under discussion here the majority of scientific men on the Board of Managers did not fit into the professional career structure of science in academic circles or Government service insofar as it then existed.

Why then were these men attracted to the R.I. and why did they continue to serve it faithfully over many years? Over and above the general reasons why men of science support learned societies, one may distinguish at the R.I. two clues to the answer, one of which was the means of recruitment, and the other may be found in their relationship to the R.I.'s Professors, Faraday and Tyndall. Taking first the means of recruiting Managers, several interesting features emerge. One must remember that the Managers were in reality a co-optive and not an elected body. They were indeed officially elected by the Members at the Annual General Meeting, but the list of those presented for election was previously drawn up by the Managers, and with unfailing regularity appears in the Minutes of the previous Managers' Meeting.(1) During this period there were no cases of a disputed election at the Annual General Meeting, and any dispute over the method of selection or the choice of person was dealt with quietly among the Managers by themselves.(2) It was possible therefore for the Managers to become a self-perpetuating hierarchy, and while this did not necessarily adversely affect the quality of the

(1) In April of each year. The Annual General Meeting was held on the 1st May, or the 2nd May, if the 1st was a Sunday.
(2) In 1845 there was a change in the method of selection which caused some difference of opinion, see below, p.79, n.5.

Institution's management, it increased the importance and size of the active as opposed to the non-active portion of the Board, since the practice was to omit from the lists for re-election those who had attended the fewest number of Meetings.

Two connected trends may be observed in the recruitment of new Managers. Firstly, the total number of new Managers was substantially lower in the 1860s than in the 1840s, but the number of new scientific men was substantially higher (see Table 1):

Table 1 Recruitment of Managers 1840-79(1)

	1840-49	1850-59	1860-69	1870-79
Number of new Managers	34	32	22	27
Number of new scientific men	3	6	7	9

The Managers thus elected the same people more frequently, and such a policy favoured the men of science, who at least in this period tended to be both faithful and long-lived. The three men of science recruited in the 1840s were all still serving in the 1870s; of the six recruited in the 1850s, two still appeared throughout the 1870s, and of the seven recruited in the 1860s, all but one served in the 1870s.(2) In the 1870s however there was a change, and only three of the nine new men of science recruited to the Board served more than two years.(3)

(1) The figure of six new scientific men (1850-59) includes W.T. Brande, who was elected a Manager in 1853, the year following his resignation. This was evidently a complimentary gesture, not repeated, and Brande remained the only man of science not to be elected for more than one term. The figures for 1860-69 do not include General Sabine, who had previously been a Manager though not since 1830. Sabine served as a Manager six years between 1862-72. The figures for 1870-79 do not include William Spottiswoode, who became a Manager in 1879 on resigning the Secretaryship, as he hardly qualifies as a new recruit. Spottiswoode was the only man elected to an office without first serving as a Manager.

(2) There were also two scientific men who survived from the days before 1840, General Sabine mentioned in the preceding note, and Sir Roderick Murchison, Director-General of the Geological Survey from 1855, who served first as a Manager in 1828 and last in 1870. Murchison was not however an active Manager, although he frequently came to the R.I., and gave or attended Discourses there.

(3) The three were Edward Frankland, formerly Professor of Chemistry at the R.I. and a close friend of Tyndall, Francis Galton, pioneer of eugenics, and C.W. Siemens, inventor and steel industrialist.

Secondly, in the period of Bence Jones' Secretaryship, a certain formal device in the selection of Managers was temporarily abandoned. In former years around half of the newly elected Managers served one or two years as a Visitor shortly before their election to the Board of Managers. In the 1860s the Visitors ceased to act as a recruitment pool for Managers, although they reverted to that position from about 1872 onwards (see Table 2):

Table 2 Managers who previously served as Visitors(1)

1840-49	1850-59	1860-69	1870-79
19	15	3	15

The majority of Managers elected directly to the Board without a probationary period as a Visitor were from the scientific or the medical world, and included long-serving Managers such as Sir Charles Wheatstone, Colonel Philip Yorke, Warren de la Rue, Colonel George Everest, John Peter Gassiot, Sir Henry Holland, Sir William Bowman, Caesar Hawkins, Lord Rayleigh and Sir Douglas Galton. One can trace in most cases a connection, either family, neighbourly or professional, with those already on the Board.(2) The management therefore by the 1860s had become a close-knit body of men with the same faces reappearing again and again, who provided Bence Jones with the necessary support for his policies.

(1) In the 1850s there were two men, and in the 1860s three men, who served as Visitors and became Managers many years later. They are not included in the table, as their term of office as a Visitor was clearly not the short probationary term before election to the Board of Managers.

(2) For example, Sir Henry Holland (first elected 1854), lived next door to John Webster M.D. (first elected 1850), which may well have had some connection with Holland's election to the Board, well-known though he was ('Membership List' (1854)). Gassiot was well known to W.R. Grove (first elected 1845) from the latter's days at the London Institution (see below, p.55). Ceasar Hawkins was a colleague of Bence Jones at St. George's Hospital. Another first recruited in the 1850s, the future Admiral Sir Henry Codrington, followed his father, Admiral Sir Edward Codrington, who had served five years in the 1840s.

Furthermore, the close-knit, scientific nature of the management was reinforced by its relationship to the R.I.'s Professors, and here two loose groupings can be discerned. The first group comprises three men who were born around 1800 - John Peter Gassiot, Colonel Philip Yorke, Sir Charles Wheatstone, and three younger adherents - Sir William Grove, Warren de la Rue and John Hall Gladstone. Broadly speaking this group may be said to have centred around Faraday. The other group were younger and had closer connections with Tyndall. The two groupings were by no means clearly aligned, and among the officers Holland belonged to the first, Bence Jones bridged both, while Spottiswoode clearly belonged to the second. Nonetheless, the influence of the first group was particularly important in the crucial period of the 1860s and therefore merits some discussion in detail. They did not necessarily act as a body, but the similarities in their approach to the Institution were more noticeable than their differences. All six men were regularly re-elected Managers, Wheatstone, Grove and Yorke from the 1840s, de la Rue from 1856, Gladstone from 1860, and Gassiot from 1861 (having previously served one year in 1853), and all were assiduous attenders at Managers' Meetings. All were deeply involved in the affairs of scientific societies, all had business interests or private means to support their scientific activities, and most important, all were inventors or experimental investigators of high standing in their own right.

John Peter Gassiot (1797-1877) was the eldest, belonging to a different generation from de la Rue (born 1815) and J.H. Gladstone (born 1827), who were receiving their scientific education in the late 1840s.(1) Among R.I. Managers, Gassiot stands out as unusual, and merits rather closer attention. He was a partner in the City wine-merchants Martinez,

(1) De la Rue was educated in Paris and then joined his father's printing business. In 1845 however he became one of the first pupils at the newly founded Royal College of Chemistry. Gladstone was educated at home, then at University College, London, followed by a period at Giessen in Germany (D.N.B.).

Gassiot & Co., as well as a man of science, and during the 1850s in perhaps the most interesting period of his career, he emerged as a utilitarian radical, active on the City Committee for the Reform of the Customs (1853), a body formed to influence legislation on Customs then in progress.(1) In 1856 he became Secretary of the Statistical section of the short-lived Administrative Reform Association (1855-57), a pressure group formed to raise the standards of public service, as a response to the humiliating events in the Crimea.(2) He was, so far as investigation has shown, the only R.I. Manager to be active on this type of pressure group at this period. Furthermore, he was a founder member of the National Association for the Promotion of Social Science (1857), a successor to the earlier utilitarian reform movements, and a society in which a number of R.I. Managers were active.(3) Nonetheless, Gassiot was equally happy working with the traditional scientific societies, in particular the Royal Society, to which indeed he proved a far more generous benefactor than he did to the R.I.(4)

The second of the group mentioned, Colonel Philip Yorke (1799-1874), had a career on a more traditional pattern. He attained some distinction as a mineralogist and meteorologist, and after selling out of the army in 1847, devoted much of his leisure to scientific societies, becoming

(1) Olive Anderson, 'The Administrative Reform Association, 1855-1857', in P. Hollis (ed.), Pressure from Without in early Victorian England (1974), p.272.n.19.
(2) Gassiot collected information on the way M.P.s voted, intended for use as a lever in electoral manipulation. This was a new and radical use of statistics for the purpose of exerting direct political pressure (ibid., p.272).
(3) This association has been briefly studied by B. Rodgers, 'The Social Science Association 1857-1886', The Manchester School of Economic and Social Studies, xx (1952), 283-310.
(4) For example, he set up the Royal Society Scientific Relief Fund in 1859 (D.N.B., and see below, p.55 with regard to the Kew Observatory). He contributed only £100 to the R.I. Donation Fund for the Promotion of Scientific Research, but he was extremely generous to individuals, offering for example to spend £50 at any time on any piece of apparatus that Tyndall desired (Tyndall, Journal V, p.260 (6 Oct 1853)).

President of the Chemical Society from 1853 to 1855.(1) Charles Wheatstone (1802-1875) was perhaps the closest friend of Faraday, and the two were constantly in and out of eachother's laboratories.(2) Professor of Experimental Physics at King's College, London, from 1834, Wheatstone rarely lectured but devoted his time to work on acoustics and electric telegraphy, for which he is best remembered.

William Robert Grove (1811-1896), a talented physicist and inventor of the Grove cell, abandoned science as a full-time career in 1847 for his work at the bar, where he was in due course appointed a judge.(3) He was one of those ubiquitous men with a finger in many scientific affairs, who maintained their scientific reputation (Grove was President of the British Association in 1866) with the occasional lecture or paper, and in these middle decades of the century was certain to be at the centre of any counsels on scientific matters.(4) Warren de la Rue (1815-1889), inventor of many devices including an envelope-folding machine, managed

(1) Yorke resigned from the army in 1847 (List of Officers of the Army, 1848-49), not "about 1852" as stated in the D.N.B. He produced thirteen scientific papers (R.S.C.S.P., vi.467-8). The Chemical Society remembered him not only as an "amateur chemist and mineralogist of very considerable ability and knowledge" but also as "an active R.I. member" (Journal of the Chemical Society (1875), 1319). He was also for a brief period in 1851-52 one of the two Secretaries of the Royal Geographical Society (Mill, op.cit., p.65).

(2) B. Bowers, Sir Charles Wheatstone (1975), p.61 and passim.

(3) Grove's work On the Correlation of Physical Forces (1846) anticipated Helmholtz and Joule on the conservation of energy, and was highly regarded, running to its sixth edition by 1874. From 1840-45 Grove was Professor of Experimental Philosophy at the London Institution. He then returned to the bar, took silk in 1853, and was appointed a judge in 1871 (D.N.B., J.G. Crowther, Statesmen of Science (1965), pp.77-101, and K.D.C. Vernon, 'The Manuscripts of W.R. Grove', P.R.I., xli (1966-67), 241-58).

(4) Grove gave fourteen Discourses at the R.I., seven of them between 1850 and 1864 ('Index to Lectures', (1842-1865) and (1866-1939)). The Grove MSS at the R.I. reveal the extent of his involvement in scientific affairs, containing many letters concerning nominations to scientific and academic positions, requests for references, petitions for support in elections to the Royal Society, invitations to give evidence at enquiries, and so forth.

his father's printing business which profited greatly from his mechanical ingenuity, and was highly regarded for his researches on celestial photography.(1) He later became Treasurer of the R.I. for a short period between 1879 and 1882.

The youngest of the group was John Hall Gladstone (1827-1902). The son of a well-to-do wholesale draper, his appointment as Fullerian Professor of Chemistry at the R.I. between 1874 and 1877 appears to have been the only occasion when he held a salaried position, and naturally he ceased at that time to be on the Board of Managers. He was well known to Tyndall from the early 1850s, but did not form a close friendship, and relations between them deteriorated rapidly from the time of Gladstone's appointment as Professor of Chemistry.(2) Gladstone too was involved in a multitude of scientific and social causes: the other scientific societies, in particular the Physical and the Chemical Societies; he was a prominent member of the Y.M.C.A.; and from 1873 to 1894 he was a member of the London School Board, a pioneer of elementary education, and a body which influenced the teaching of school science for many decades after.(3)

The determining factor in the attitude of all these men to the R.I. was that they alone among the Managers (with the exception of Yorke)

(1) He produced fifty-five scientific papers on his own account, and a further twenty-nine in collaboration with other scientists. He continued to take part in the management of the De la Rue printing business until 1880, with a brief gap from 1869-70 (D.N.B.).
(2) Tyndall and Gladstone corresponded at some length in 1851 on religion, until Tyndall got bored and irritated (R.I. Tyndall MSS, Correspondence 10/C1.1-3, 10/C3.1-2). All references to letters in the Tyndall MSS are to the James Friday microfiche catalogue, see bibliographical note,pp.314-15). For the deterioration of relations between them, see below, p.282.
(3) Gladstone was President of the Physical Society from 1874-76, and of the Chemical Society from 1877-79. For his work with the Y.M.C.A., see C. Binfield, George Williams and the Y.M.C.A.: A Study in Victorian social attitudes (1973), pp.271-2. There is a short description by Gladstone of the London School Board sub-committee on books and apparatus, of which he was chairman for nineteen years from 1877, in L. Huxley, The Life and Letters of Thomas Henry Huxley (1900), i.350.

were directly involved at one time or another with Faraday in his scientific work. This was a quite different situation to that of previous years. Men of science naturally consulted each other frequently about their investigations, but the presence of such men of science on the Board of Managers lent a very different perspective to their relationship to the Institution and its working Professors. Wheatstone and Faraday constantly consulted each other, as mentioned above. Gassiot collaborated with Faraday on electrical effects in rarified gases, work which was a continuation of research by Grove in the early 1850s.(1) De la Rue designed and had apparatus constructed for Faraday, and also helped in the latter's experiments on gold.(2) Gladstone was a member of the Commission of Enquiry into lighthouses, buoys and beacons (1859-1862), where he frequently consulted with Faraday in the latter's capacity as scientific adviser to Trinity House.(3) Their view of the R.I. in this period would therefore depend a great deal on their view of Faraday. Care for his physical well-being was certainly one of their overriding concerns,(4) and for the facilities

(1) Faraday's work in this field is described by L. Pearce Williams, Michael Faraday (1965), pp.474-8. See also Gassiot's generous acknowledgement of Faraday's help and time in his paper on the subject, 'On the Stratification and Dark Band in Electrical Discharges as observed in Torcellian Vacua', Philosophical Transactions of the Royal Society of London, cxlviii (1858), 16 (hereafter cited as Phil.Trans.).

(2) De la Rue designed apparatus for Faraday to observe the effects of magnetism on polarized light as early as 1851 (de la Rue to Faraday, 16 Dec 1851, in Williams, Selected Correspondence, ii.646-7). For de la Rue's help in Faraday's experiments on gold see his letters to Faraday of 9 Feb, 11 and 13 Oct 1856 (ibid., ii.828-9, 856-7), and Faraday's references to de la Rue in his paper, 'Experimental Relations of Gold (and other Metals) to Light', Phil.Trans., cxlvii (1857), 145-81, especially pp.146, 152, 155. Professor Pearce Williams describes this work but does not mention de la Rue's help (Michael Faraday, pp.471-4). De la Rue also kept Faraday informed about his photographs of the moon and of the 1860 eclipse (Williams, Selected Correspondence, ii.879-80, 993-6), and in 1861 Faraday gave a Discourse 'On Mr. Warren de la Rue's Photographic Eclipse Results' (P.R.I., iii (1858-62), 362-6).

(3) Faraday to Gladstone, 2 July 1859, in Williams, Selected Correspondence, ii.992-3. See also E. Becker to Faraday, 12 Sept 1860, which refers to Faraday and Gladstone often meeting "on the Lighthouse Committee" (ibid., ii.969), and Gladstone's own description in J.H. Gladstone, Michael Faraday (1872), pp.131-4.

(4) See Gassiot's admonition to Faraday not to over-work, 26 Dec 1845 (Williams, Selected Correspondence, i.478).

enabling him to carry on his research was another. All were themselves researchers. Wheatstone, Gassiot and de la Rue certainly understood the necessity of having the right apparatus, and the difficulties of getting a complicated new device made exactly according to one's wishes. Gassiot was particularly generous with his apparatus, his house at Clapham Common being provided with the best.(1) All except Grove contributed to the Donation Fund for the promotion of scientific research set up by Bence Jones in 1853, and de la Rue made several later donations, besides giving much of his apparatus to the R.I.(2)

Moreover, they constantly crop up as being involved in the same scientific affairs. Grove and Gassiot were close collaborators in the setting up of the Philosophical Club, and attempts to reform the Royal Society in the late 1840s.(3) It was Grove and Gassiot, together with the out-going President Lord Wrottesley, who formed the delegation in 1857 to offer Faraday the Presidency of the Royal Society.(4) Then there was the Kew Observatory, a foundation supported primarily by the British Association, where de la Rue made many of his observations and designed a heliograph for taking a daily photographic record of the sun.

(1) Gassiot put all his apparatus at Faraday's disposal as early as 1845 (ibid., i.478-9). New apparatus had often to be obtained from the Continent, an expensive procedure, which often called for much co-operation between scientists. As Professor Pearce Williams noted, Gassiot was one of the first in England to obtain Geissler evacuated glass tubes (op.cit., p.475), but one should add that it was through Bence Jones that Gassiot obtained these tubes (Phil. Trans., cxlviii (1858), 14).

(2) Gassiot, Gladstone, de la Rue contributed £100 each, and Wheatstone £50. These were the largest individual sums after Holland's annual £40 donations which amounted to a total of £600. De la Rue gave a further £350 between 1878-88. This was far beyond the average donation of £5-10 to scientific societies in these years, although there were occasional munificent donations. For de la Rue's apparatus see R.I. Faraday MSS, Notebook (16), p.10.

(3) This forms the main subject of their correspondence in the R.I. Grove MSS; more information on their efforts may be found in the Royal Society, such as for example, letters from Gassiot to Sir John Herschel, the astronomer, on 5 Mar and 17 Apr 1847 (Archives of the Royal Society, H.S. 8.55, 8.56).

(4) A print of this delegation in May 1857 may be found at the R.I. See also, J. Tyndall, Faraday as a Discoverer (1868), p.156.

Wheatstone had been involved in its establishment, Gassiot and de la Rue were on the Kew Committee, of which Gassiot as Chairman handled requests to the Royal Society for donations for equipment.(1) Gassiot indeed finally purchased the Kew Observatory for £10,000 and presented it to the Royal Society.(2) All naturally were active in the British Association, and the specialised scientific societies, and Gassiot and de la Rue were both active in the one other large non-specialised scientific institution, the R.I.'s rival and imitator in the City, the London Institution, where Grove had once been Professor of Experimental Philosophy. This suggests some interesting points. In the 1860s the London Institution also went through a successful period when its laboratory made a reputation for chemical research.(3) It too gave courses of lectures and evening soirees on the R.I. model. However, it still retained a proprietorial structure, in contrast to the R.I. which had discarded its proprietory system in 1810. In the City it provided much the same mixture of science and literature (with an added dash of commerce) as the Royal Institution offered in the West End of London.(4) It too was

(1) Wheatstone also designed a number of meteorological instruments for Kew, as well as being concerned with the day-to-day administration (information from Brian Bowers, Science Museum). The Annual Report of the British Association for each year up to 1872 contains the "Report of the Kew Committee" signed by Gassiot, giving details of the work done during the year. Correspondence concerning donations from the Royal Society is held in their archives.
(2) In 1871 the Royal Society set up a Standing Committee for the management of the Observatory, which naturally included de la Rue, Gassiot and Wheatstone (British Association Annual Report (1871), p.xlvi). De la Rue became chairman of this committee after Gassiot's death in 1877, until his own in 1889.
(3) At this time J.A. Wanklyn was Professor of Chemistry. See the list of scientific papers, thirteen in all, from the London Institution laboratory published in the Journal of the Chemical Society, listed in the London Institution, Report of the Committee of Management (1867). Copies of the London Institution Reports may be found in the Guildhall Library, London.
(4) See the lecture syllabuses for the London Institution from 1845 onwards (Guildhall Library, London Institution MSS SL50/2), and below, pp.207-8 for comparisons with the R.I. programme. From 1854 the commercial element was provided by the Travers Trust Fund providing for an annual course of lectures on commerce or commercial law. J.I. Travers was an old ally of Gassiot, as the chairman of the City Customs Reform Committee and Treasurer of the Administrative Reform

a mixture of professional and amateur, of scientific research and literary lectures. Gassiot and de la Rue both therefore saw this type of institution with its old-fashioned proprietorial structure as viable and useful in the organisation of science.(1) One might infer that at both the London and the Royal Institution they found an opportunity for patronage, and patrons they were as their personal generosity demonstrated in a concrete sense. This was a fundamentally different approach to that of the younger generation. While one need not claim that here is another of those networks that historians are fond of discovering, it is no exaggeration to say that this was a key group of influential figures in that larger body of men who bore the main burden of the organisation of scientific societies and institutions. They were bound by no formal ties except those of common interests; their backgrounds were varied, but all were characterised by that highly prized attribute, independence; and the bonds of personal friendship, scientific collaboration and service to the same organisations are nowhere more clearly demonstrated than at the R.I.

The second group among the Managers was one that had close connections with Tyndall. A significant number of the younger scientific men among the Managers were members of the 'X' Club, formed in 1864 for the purpose of encouraging each other professionally and furthering the advance of science. There is no need for a long digression here on the 'X' Club, which has been the subject of two recent studies.(2) But the

Association (Anderson, loc.cit., p.269). I am grateful to Miss Janet Cutler for allowing me to see her thesis on the London Institution (1805-1933), which is nearing completion at the time of writing.

(1) De la Rue was a manager of the London Institution from 1854 onwards and became its President from 1874-78. Gassiot was on the Board of Managers from 1840 until his death in 1877. He also used its laboratory when necessary, as Tyndall mentioned (Journal VIIIa, p.91 (5 Dec 1859)); another occasion when Tyndall was present was mentioned by Gassiot in his paper (Phil.Trans. cxlvii (1858), 6).

(2) R. Macleod, 'The 'X' Club: a social network of science in late Victorian England', Notes and Records of the Royal Society of London, xxiv.2 (Apr 1970), 305-22. J. Vernon Jensen, 'The 'X' Club: Fraternity of Victorian Scientists', British Journal for the History of Science, v (June 1970), 63-72.

names of its nine members deserve repetition: Thomas Henry Huxley, Edward Frankland, Joseph Dalton Hooker, Sir John Lubbock, Herbert Spencer, George Busk, Thomas Archer Hirst, William Spottiswoode and John Tyndall. The R.I. was one, though not the chief, subject of their discussions.(1) Huxley and Frankland both held professorial posts at the R.I. in the 1860s. Lubbock and Busk became Managers in the 1860s, Frankland and Hooker in the 1870s.(2) Busk became Treasurer in 1873 when Spottiswoode took over as Secretary. Tyndall was therefore never short of friends and scientific allies among the Managers.

The 'X' Club can be said to have dominated the management from the early 1870s, in contrast to the looser grouping described above whose influence was pervasive in the 1850s and most importantly in the 1860s. It is surprising that such a notable body of reformers and educationists as the 'X' did not make any substantial impact on the Institution's direction earlier in the 1860s. This can only be accounted for by the fact that Bence Jones had already pre-empted the vital issue at the R.I. Bence Jones' views on the importance of research would certainly be agreeable to the 'X' Club, and even more so his methods of ensuring this by providing facilities and endeavouring to pay reasonable salaries to the Professors.(3) That they supported Bence Jones' endeavours is certain, but beyond that they appear to have taken no initiatives at the R.I. in this period. This was probably because their eyes were fixed on larger targets, the British Association and the Royal Society, where their efforts were more likely to be widely influential.(4) If Tyndall was happy with the way the R.I. was organised, then the 'X' would have found

(1) No mention of the R.I. is made until the ninth meeting on 5 Oct 1865, though the record of subjects discussed is only fragmentary. The Royal Society and the British Association were the chief subjects recorded (R.I. Tyndall MSS, 'X' Club Notebook,i. (1864-1879), passim. This notebook is not paginated.)

(2) See Appendix I for dates of Professors' appointments, and Appendix II for biographical details of Managers.

(3) See below, pp.157-65.

(4) Macleod, loc.cit., p.310.

little to do there. It might, for example, influence the choice of a speaker for a Discourse, but its most dramatic impact was not at the R.I. There, Bence Jones had already determined the main lines of the Institution's future.

The crucial matter with regard to those Managers who were not the men of science discussed above, is not any sharp division between professionals and amateurs, but the contemporary definition of the word "literature". In the mid-nineteenth century to be a man of "literature" meant to be educated in the classics and mathematics according to the traditional pattern of the ancient universities. It is not unusual to find "men of letters" and "men of science and literature" used as almost interchangeable terms. As mentioned earlier, it is as though "science and literature" were thought of as a hyphenated word, as embracing two aspects of the same thing, as referring to polite learning in general. Again, it is the use of these key words that helps to pinpoint changes in ideas, and indeed until the word "scientist" as the practitioner of a distinct branch of knowledge, became widely used and accepted, there was no sharp linguistic division between the two. Men of science in the mid-century would have been reluctant to describe themselves as being anything other than "literati" in the sense of being educated men. The term "science and literature" used in this, as it were, hyphenated sense, lingered on in official R.I. documents until the end of the century. From 1852 it was even included among the R.I.'s formal objectives: "To promote scientific and literary research".(1) At first glance it may appear surprising that at the very time that scientific research was beginning to be officially recognised as the R.I.'s prime objective, an explicitly non-scientific element was also for the first time deliberately

(1) 'Prospectus' (1852), p.i (Annual Report 1851, in Membership Lists (1851-54)). See also below, pp.149-50.

stated to be among the R.I.'s concerns. This serves once again to emphasize how misleading it is to think of the R.I. solely in terms of a scientific institution in the modern sense of the word "scientific", and the importance of the non-scientific element in the R.I.'s history deserves far fuller recognition.

The homogeneous nature of "science and literature" began to break down from the mid-nineteenth century onwards, not least because of the emergence of the professional scientist. The change in character is revealed in an examination of these gentlemen of letters and learning, the men of "science and literature" whom today one would clearly regard as being non-scientific, but who would not at the time have seen themselves as non-scientific. However, for ease of reference these men will be described as the "literary element" in the management, remembering that the term is used in its broadest sense. In the 1840s the literary element was gentlemanly or aristocratic, based on the age-long tradition of patronage of Renaissance-humanist-Enlightenment lineage, which viewed science as appropriate among the accomplishments of a gentleman. Such men also applauded the useful applications of science, in which the mine-owners or agriculturalists among them had a direct interest.(1) However these men were clearly at home in all types of learned society and self-interest was only one motive.

These attitudes were clearly exemplified in two of the chief officers of the 1840s, the Duke of Northumberland and W.R. Hamilton, who have already been described. Among the Managers, many of these men were only elected on one or two occasions, and their presence on the Board was clearly ornamental rather than influential. But of those who were regularly re-elected as Managers, one may point to their membership of other learned societies, in particular the Society of Antiquaries, as a clear expression of their many-sided culture.(2) Sir John Boileau

(1) For example, Sir Charles Lemon (see Appendix II.iii).
(2) The Society of Antiquaries, founded in 1707, was the oldest and, at least until the mid-century, considered the most prestigious of the non-scientific societies.

(1794-1869), who served as a Manager for six years between 1843 and 1853 and again twice in the 1860s, was a gentleman more enthusiastic than learned, for as his biographer has stated, his interests were comprehensive - artistic, literary and scientific.(1) Such matters were the "proper affairs of a gentleman", and one finds Sir John serving on the governing bodies of the Royal Society of Literature, the Zoological Society, the Statistical Society, the British Association, the Society of Antiquaries, acting as a juror for the 1851 Exhibition, besides presiding over his local Norfolk Archeological Society.(2) Naturally the interests of these "compleat men", the survivors of the Enlightenment, were very varied. For example, Benjamin Bond Cabbell (1781-1874) was a well-known patron of the arts who also had an interest in newly founded institutions for scientific education such as the Royal College of Chemistry, of which he was Treasurer from 1845 to 1853.(3) Sir Charles Fellows (1799-1860), the traveller and collector of classical antiquities, was also an active member of the British Association.(4) One may trace the same type of interest in other men of the older generation, for example, Henry Hallam, the historian (born 1777), Sir Oswald Mosley Bt. (born 1785), who wrote on archeology, and Edward Rudge (born 1792), the antiquary, none of whom served as Managers after 1850.(5)

(1) Owen Chadwick, Victorian Miniature (1960), p.64.
(2) Chadwick, op.cit., pp.64-66; D.N.B.; Official Catalogue of the Great Exhibition (corrected edition 1851), p.319.
(3) D.N.B., and G.K. Roberts, The Royal College of Chemistry (1845-1853): A social history of Chemistry in Early Victorian England (unpublished Ph.D. thesis, John Hopkins University, 1973). See below, pp.74-9 for Cabbell's activities in the R.I. as Treasurer of the Patrons of the Library.
(4) D.N.B. and Appendix I.i.
(5) See D.N.B. for Hallam and Rudge, and Appendix II, iii. Hallam was a Manager in 1822, 1824, 1831 and 1850; Mosley was a Manager seven times between 1825-43; Rudge was a Manager in 1848, but had served many years previously as a Visitor. Rudge was also brother-in-law to William Pole, the R.I.'s Treasurer (Burke's Peerage and Baronetage (Van Notten Pole baronetcy)). Hallam was an old colleague of W.R. Hamilton in the Society of Antiquaries (Evans, op.cit., p.242).

After 1850 however patrons of learning in the Enlightenment tradition were elected far less frequently to the Board. There were indeed always a few gentlemen and antiquaries and also always an aristocratic element, but by the 1860s and 1870s it was unusual for there to be more than one aristocratic Manager on the Board in any one year. Such men were ornamental in one sense, imparting a degree of status and dignity to the Board, but they also maintained the aristocratic tradition of patronage of learning. Some indeed were scientific amateurs of long standing such as Lord Salisbury,[1] or men such as the fifth Earl Stanhope, the historian and President of the Society of Antiquaries, or William Baring, second Baron Ashburton, the politician and educationist.[2]

The nineteenth century also saw the development of another and totally different type of "man of letters", the man who made money from being precisely that, thanks in large measure to the enormous expansion of periodical literature from the mid-century.[3] Not until the twentieth century did such "men of letters" form a separate profession; in the 1850s and 1860s the kind of literary activity they undertook, their financial dependence on some other professional activity, and the social circle they belonged to, all clearly connect them to the new intelligentsia of the period rather than to the ancient tradition of aristocratic patronage of "letters". Such men who were Managers were not however many. One cannot omit to mention Thomas Babington Macaulay, a Visitor in 1844 and a Manager in 1851. He was not however an active Manager, and attended only one meeting.[4] Easily the most important of the

(1) Salisbury kept a private laboratory, and published some articles on scientific subjects (D.N.B.; R.S.C.S.P., viii (1879), 817; The Wellesley Index i.841).
(2) See D.N.B. for both men.
(3) See J. Gross, op.cit., chaps 2 and 4; and R.G. Cox, 'The Reviews and Magazines', in Boris Ford (ed.), The Pelican Guide to English Literature, (1973), vi, pp.188-203.
(4) On the occasion of the election of the Fullerian Professor of Physiology (Man.Min., X. 344 (8 July 1851)).

genre was William Frederick Pollock (1815-1888). Pollock was a very successful lawyer from a family of many lawyers, and was appointed Queen's Remembrancer in 1874.(1) He was a close friend of Tyndall and Bence Jones, and one of the most assiduous and hardworking of the R.I.'s Managers during the twenty-four years he served between 1851 and his death in 1888. Among his many leisure activities, he was an active committee member of the Literary Fund from 1855, a member and benefactor of the Royal Toxophilite Society, a Trustee of the Soane Museum, and the Secretary (as W.R. Hamilton had been before him) of the Dilettanti Society from 1876 to 1888.(2) Moreover, his own literary contributions were considerable, and included an excellent blank verse translation into English of Dante's _Divine Comedy_, editing the actor Macready's diaries and reminiscences, writing his own _Personal Remembrances_, and contributing articles and reviews on literary subjects in general to a wide range of periodicals.(3) He also held the post of literary editor of the short-lived _Reader_ (1863-66), the forerunner of _Nature_.(4) His social circle included everyone of note in the scientific and literary world, and as a member of the "Breakfast Club", he belonged to one of the most notable of literary gatherings.

From the mid-1860s Pollock and a fellow lawyer, R.P. Roupell, Q.C.

(1) See _D.N.B._ and Pollock's own _Personal Remembrances_ (1887), 2 vols. Pollock's father, two uncles, three brothers and one half-brother were all in the legal profession (_Burke's Peerage and Baronetage_ (Pollock of Hatton, Middlesex, baronetcy)).
(2) Pollock, _op.cit._, passim; Cust, _op.cit._, pp.196-7.
(3) Dante's _Divine Comedy_, rendered into blank verse by W.F. Pollock (1854); W.F. Pollock (ed.), _Reminiscences and Selections from W.C. Macready's Diaries and Letters_ (1875), 2 vols., (new ed. 1876, 1 vol.); _The Wellesley Index_ lists articles and reviews by Pollock in the _Edinburgh_, _Quarterly_, _Fortnightly_, _Fraser's Magazine_ and _Nineteenth Century_ (i.1052, ii.1044). These included scientific as well as literary topics, such as a review of Sir Charles Lyell's _The Antiquity of Man_ (_Fraser's Magazine_ lxvii (Apr 1863), 463-75). He and his wife also wrote Faraday's obituary in the _Illustrated London News_ (_I.L.N._ (14 Sept 1867), 280-2; Pollock, _op.cit._, ii.167).
(4) See A.J. Meadows, _Science and Controversy: A biography of Sir Norman Lockyer_ (1972), pp.17-24, for details of the _Reader_'s brief life, and Pollock, _op.cit._, ii.129-33, for his account of his time with the _Reader_.

(1798-1886),[1] a collector of books and old master sketches, were the only men of this type to be regularly re-elected to the Board, although James Spedding (1808-1881), editor of Bacon's works, did serve for three years as a Manager between 1878 and 1880, shortly before his death the following year. With the exception of the occasional aristocrat or gentleman antiquary, their colleagues among the Managers were either scientific men, or men from the professions - doctors, surgeons, engineers[2] - who as younger men educated in the 1830s and 1840s had escaped the obligatory classical education of former years. Yet paradoxically in the very years that the R.I. was becoming more scientific and professional in the composition of its management, it encouraged a literary element more strongly than ever before in its activities, in the Courses of Lectures, in the Friday Evening Discourses, and in the Library.[3] It continued to invite a non-scientific and a literary participation which will be illustrated in the composition of its Membership, analysed in the following chapter.

During the middle decades of the century, there were three men - William Thomas Brande, Michael Faraday and John Tyndall - whose work and opinions naturally played an important part in the Institution's development. The Professors not only formed an integral part of the management, but their activities provided the magnet of the Institution's

(1) Roupell served as a Manager twelve years between 1858-74. In 1870 he sold his library, which consisted principally of early French poems and _romans_, for £2,089 (_Atheneum_, 6 Aug 1870, p.178). His collection of old master sketches and engravings was sold after his death for £7,759 (_Annual Register_ (1887), pt.ii, 90).
(2) The number of engineers among the Managers was few until the later decades of the century. W.G. Armstrong and James Nasmyth were both elected once, in 1863; Armstrong was President of the British Association that year, and Nasmyth was an old friend of Faraday. The only engineer to be regularly re-elected in the period under discussion was George Berkeley (see Appendix II.i)
(3) See below, chap. 5.

attraction to the general public, and the mainstay of its reputation. The detailed role each played will be examined at the various turning points in the Institution's history, but in the present context it is relevant to discuss here the general background and outlook of each man, and the type of influence they exerted over the Institution's development.

William Thomas Brande (1788-1866) had joined the R.I. many years before in 1813. He came from a well-known family of apothecaries and at the age of fourteen started his career as an apprentice to his apothecary brother, Everard.(1) In the same year, 1802, he came into contact with Charles Hatchett, an influential chemist, and encouraged by Hatchett, by 1805 was already publishing original work on benzoin.(2) In 1808 Brande started teaching chemistry at two small medical schools, a year later he was elected an F.R.S., and in 1813 joined the R.I. as Professor of Chemistry in succession to Humphrey Davy. He failed however to fulfil at the R.I. his earlier promise of significant original work in chemistry.(3) Such work that he did was directed solely towards the practical applications of science, and indeed his appointment in 1825 as Clerk of the Irons and Superintendent of Machinery at the Royal Mint was the result of his investigation in 1823 on metal dies. He was extremely industrious, an energetic man of science, who undertook an enormous amount of professional consultancy, produced a constant stream of books, lectures, reviews and articles on chemistry, geology, pharmacy

(1) For information on Brande, see D.N.B.; L.G. Mathews, The Royal Apothecaries (1967), pp.152-4 on the Brande family; C.H. Spiers, 'William Thomas Brande, Leather Expert', Annals of Science, xxv.3 (Sept 1969), 179-201, gives much detail on Brande's life. M. Berman, 'Introduction', Man.Min. VI, discusses Brande's domination of R.I. affairs in the 1820s.

(2) Spiers, loc.cit., p.186. In 1818 Brande married Hatchett's second daughter.

(3) A. Tulley asserts that the majority of Brande's more important experimental investigations were carried out before 1813, when he became Professor of Chemistry at the R.I. (A. Tulley, 'The Chemical Studies of W.T. Brande', P.R.I., xliv (Dec 1971), 260).

and other scientific and medical topics, besides playing an active role in the affairs of learned societies.[1] Much of his industry was directed towards obtaining a satisfactory income as he had five children to support and had been virtually cut out of his father's will in 1829.[2] But long before financial strains made the pursuit of a large income a dominating factor, he had abandoned original experimental research, and over and above his interest in the practical applications of science, he should be remembered as a medical man, a trained apothecary, concerned to provide for the needs of the medical profession, in particular for their educational needs. His involvement in the medical profession took formal shape as early as 1812 by his appointment to the Professorship of Chemistry at the Society of Apothecaries, to which he added the following year the Professorship of Materia Medica. He later served in 1851-1852 as the Master of the Society.[3] He also held a post as lecturer in chemistry at St. Bartholomew's Hospital from 1836 to 1841, so his links with the medical profession were not confined to the Apothecaries.[4] In the 1840s, the last decade of his long career at the R.I., Brande was regarded as a busy man of science, as a thorough and reliable expositor of known facts, and from this point of view he was highly regarded by the majority of the Managers at that time.[5]

~~After 1831, Brande was totally overshadowed by his former assistant~~

(1) Brande was evidently constantly in demand as a scientific witness in court cases (information received from Dr. Berman). He wrote several textbooks: Outlines of Geology (1817), A Manual of Chemistry (1819), A Manual of Pharmacy (1825); he edited the Journal of Science and Arts from 1816-31; he also edited the popular Dictionary of Science and Art (1842, new ed. 1865-7). He was one of the two Secretaries of the Royal Society from 1816-26, and was active in the Chemical Society, becoming its President from 1847-49.
(2) Spiers, loc.cit., pp.183-4.
(3) L.G. Mathews: History of Pharmacy in Britain (1962), pp.246-7.
(4) V.C. Medvei and J.L. Thornton (eds.), The Royal Hospital of Saint Bartholomew 1123-1973 (1974), p.265.
(5) See for example, Man.Min., IX.417 (16 Nov 1846), cited below, p.145.

After 1831, Brande was totally overshadowed by his former assistant, Michael Faraday (1791-1867), who with his discovery of electro-magnetic induction in that year, quickly established a reputation as an outstanding scientist. To Faraday the R.I.'s most important feature was the laboratory where he could pursue experimental research. From the early 1830s he renounced paid industrial scientific work in order to concentrate on his own investigations, but naturally there were other demands on his time.(1) As his reputation as London's and indeed England's premier scientist was established, he was frequently called upon by various Government departments for advice, to undertake analyses, or to carry out investigations.(2) It would indeed have been strange if this had not been the case. Faraday if possible never refused such demands, and, except in one instance, declined all offers of payment, agreeing to do the work from motives of patriotism and loyalty alone.(3) His view of scientific research was above all disinterested and free from any obligation of payment, whether by professional, commercial or Government interests, and this view he pursued at the R.I.

It is indeed not surprising to find such an attitude in one of Faraday's character, which has been described at length by many people.(4) His sweetness of character, his love of truth, his persistent search for proof rather than indulging in theoretical speculation found many

(1) During the 1820s Faraday had been kept busy by Brande doing many analyses (Bence Jones, Faraday, i.382). Tyndall states that Faraday's income from commercial work reached its peak in 1831 (£1090.4s.), and thereafter declined very sharply, petering out altogether by 1838 (D.N.B.; Williams, Michael Faraday, pp.322 and 359, n.8).
(2) See, for example, Faraday to Lord Auckland, 29 July 1847, where he mentions consultations from the Admiralty, the Ordnance, the Home Office, and the Woods and Forests (Williams, Selected Correspondence, ii.508).
(3) The exception was the investigation made jointly with Sir Charles Lyell, the geologist, into the Haswell colliery explosion in 1844.
(4) The most recent full-length biography of Faraday is by L. Pearce Williams, Michael Faraday (1965). I rely on Professor Pearce Williams' penetrating study as a basis, and the following remarks are intended simply to emphasize the way in which certain traits in Faraday's character affected the R.I.'s management.

admirers, both in his own life-time and afterwards. The Managers treated Faraday with unqualified respect, although this did not prevent them from keeping his salary at the beggarly level of £100 p.a. until 1853.(1) As Faraday said a few years later: "It was only quite recently that the thought of bettering it had occurred to the authorities".(2) Salary was not a relevant factor in scientific research in the Managers' eyes, an attitude re-inforced by Faraday's selfless devotion to the Institution, until Bence Jones first raised the question in the late 1850s.(3) Nor did the Managers spare Faraday time or effort in their constant requests to attend to details of house repairs, ranging from experimental investigation of the perennial problem of ventilating the lecture theatre, to obtaining estimates for new seat cushions, or guard rails, or overseeing the re-carpeting of rooms.(4) Much of this was naturally the duty of the Superintendent of the House, and the Managers would not have felt themselves to be inconsiderate in any way, but it serves to emphasize that Faraday, although he might be England's greatest living scientist, was also the servant of the Institution, and subject to its corporate direction. Faraday never questioned this, and the keynote of his relationship to the Managers was loyalty. However much he might disagree with the position the Managers took, he sought to mediate, to compromise, and never expressed any criticism of

(1) This was Faraday's salary as Director of the Laboratory. As Superintendent of the House he did not receive any separate salary. He did however receive £100 p.a. as Fullerian Professor of Chemistry, the Professorship endowed by John Fuller in 1833, and also £100 for any Christmas course of Juvenile lectures that he gave, as well as generally a sum of 100 gns. for any afternoon Course of Lectures, as for example, in 1840 for his Course on "Chemical Affinity" (Man.Min., IX. 138 (6 July 1840)).

(2) Tyndall Journal VII, p.275 (20 Feb 1858).

(3) See below, pp.157-8.

(4) Every year Faraday got estimates for repairs to be carried out during the summer recess and superintended their completion. In addition there were frequent requests at other times of the year, for example, ordering new seat cushions (Man.Min., IX. 295 (18 Mar 1844)), work on the ventilation of the theatre (<u>ibid</u>., IX. 91-2, 105 (17 June and 18 Nov 1839), X. 372-5 (1 Mar 1852)), or new shelves to be put up in the Model Room (<u>ibid</u>., XI. 77 (6 Nov 1854)).

the Board's decisions. He was the soul of discretion.

This brings out one in particular of Faraday's talents. Faraday was adept in the use of managerial language. He was master of the nuances of the resolution, the wording of the final minute, and the drafting of a "note".[1] This was perhaps an essential talent for the preservation of his integrity in a situation where his view of the Institution's priorities diverged from that of the Managers. But it does highlight the fact that, had Faraday so wished, he could (as Davy had done) have manipulated the Managers with little difficulty and directed the Institution along the path he desired. However, he was content to take any opportunity which presented itself of stating his views of the Institution's objectives, leaving the initiative and the final control of affairs in the hands of the Managers.

In 1852 Brande finally resigned, giving ill health as his reason.[2] A more pressing factor however was the increase in his work at the Mint under the new regime of Sir John Herschel, the astronomer and Master of the Mint from 1850.[3] In addition Brande's salary at the Mint was raised on his appointment as First Superintendent of the Operative Department.[4] The man who replaced him was not a chemist, but John Tyndall, appointed Professor of Natural Philosophy in June 1853. Tyndall (1820-1893), the son of an Irish schoolmaster, came to science

(1) For examples, see below, pp.146, 156-7.
(2) Man.Min., X. 379 (16 Mar 1852).
(3) The Mint was reorganised following the Royal Commission on the Constitution, Management and Expenses of the Royal Mint (1848); the contractual management was replaced by appointment as servants of the Crown, and private business and fees prohibited (Sir John Craig, The Mint (1953), p.317).
(4) *Ibid.*, p.320. Brande appears to have delayed his resignation from the R.I. as long as he could, as his new appointment at the Mint was made on 14th January 1852, and his resignation from the R.I. was first mentioned two months later. His reason was probably loss of prestige, although he was appointed Honorary Professor of Chemistry (General Monthly Meeting Minutes, VI. 26-8, 39 (5 Apr and 3 May 1852) hereafter cited as Gen.Min.), and the knowledge that effectively his connection of nearly forty years with the Institution was at an end. He was for instance never invited to lecture again at the R.I.

through railway surveying work, and like so many others in the 1840s, went to Germany to obtain a higher scientific education.[1] He returned to become a schoolmaster at the Quaker academy of Queenwood in Hampshire, meanwhile pursuing research in his spare time and looking for a suitable scientific post. Introduced by Bence Jones to the R.I., he displayed that essential quality for an R.I. Professor, the ability to lecture extremely well, and following his appointment soon made a reputation as an attractive lecturer as well as a talented researcher.[2]

There was one consequence of the particular relationship between Faraday and the Managers which concerned Tyndall. During the 1840s both Brande and Faraday were present at Managers' Meetings.[3] After Brande resigned in 1852, Faraday was the only Professor attending Managers' Meetings until 1865.[4] During that long period of twelve years, Faraday was, if the case arose, the official mouthpiece for Tyndall. This appears to have suited Tyndall at least during the 1850s, for his respect for Faraday's personal judgement and conduct was unqualified, and he was more than fully occupied ~~by~~ with his lecturing and research.[5] However in 1860 Bence Jones became Secretary, and a new energy invigorated the management. Meanwhile Faraday's health and mental abilities continued their slow decline, and in 1862 he gave his last Friday Evening Discourse,

(1) The main details of Tyndall's life may be found in the D.N.B., and in A.S. Eve and C.H. Creasey, Life and Work of John Tyndall (1945).
(2) See below, pp.151-2 for the events leading up to Tyndall's appointment.
(3) Unless detained elsewhere. They were listed after the names of the Managers present (Man.Min., IX-X).
(4) Faraday then resigned as Director of the Laboratory. The Managers' accepted his resignation, but left the position otherwise unchanged, except to invite Tyndall and Frankland to attend Managers Meetings in future (Man.Min., XII. 99 (6 Mar 1865)).
(5) Tyndall always consulted Faraday and followed his advice on such matters as, for example, the dispute on the Royal Medals awarded by the Royal Society in 1853 (Eve and Creasey, op.cit., pp.45-7), or on the dispute about the R.E. examination results (Tyndall, Faraday as a Discoverer, pp.158-61). Tyndall was very busy in the 1850s lecturing at the London Institution (1855-59), at Eton (1857), acting as examiner for the War Office for candidates for R.A. and R.E. commissions (1855-56), besides visits abroad, research and lectures at the R.I.

as research and lecturing became too much for his failing memory. In 1861 he had with characteristic humility and generosity, offered to resign his professorship and position as Superintendent of the House, but the Managers, with delicately phrased tact, requested him to remain and only undertake what duties he could manage.(1) The R.I. was after all also Faraday's home, although from 1858 a grace and favour house near Hampton Court was available to him. He retained his apartments at the R.I., but spent an increasing amount of time at the Hampton Court house when the season had ended.(2) Throughout the years up to 1866 Faraday attended Managers' Meetings with unfailing regularity, and even in 1867, the year of his death, sent messages to the Managers reporting little details such as the conduct of the porter.(3) In the awkward situation where the respected elder figure was still in residence, Tyndall was in effect left out of the Institution's management for too long. He did not attend a Managers' Meeting until May 1865.(4) Faraday even continued to manage the Petty Cash, including the laboratory bills. The accounts are in his hand until December 1865, then in his niece, Jane Barnard's hand. Faraday signed her accounts until May 1866, but from that time until the end of 1867, the accounts are signed as paid by "J. Barnard for M. Faraday". It was Faraday's family who took over his administrative duties, not Tyndall, as one might have expected.(5) While Tyndall naturally helped Bence Jones in organising the Institution's activities, he had little formal contact with the Managers, and a stiff

(1) At this time Faraday resigned the Juvenile lectures, which he had given for the previous ten years (Man.Min., XI. 395-7 (4 Nov 1861)).
(2) When H.E. Roscoe, the chemist, visited Faraday a year before his death, in June 1866, it was in his rooms at the R.I., not at Hampton Court (H.E. Roscoe, The Life and Experiences of Sir H.E. Roscoe (1906), p.136).
(3) The last Managers' Meeting Faraday attended was in February 1866 (Man.Min., XII. 128 (5 Feb 1866). His report on the porter's conduct may be found in Man.Min., XII. 178 (4 Mar 1867).
(4) Man.Min., XII 107 (8 May 1865).
(5) Faraday MSS, Petty Cash Book II (21), 1851-1867.

letter to Bence Jones in January 1866 shows that this had rankled.(1) Tyndall asserted that he had no wish to interfere with the rule and governance of the R.I. He had been a dozen years at the R.I. without once being invited to a Managers' Meeting. He would not have put up with it in other circumstances, and did not wish to interfere now: "Their (the Managers') desire will be best carried out by leaving me and my assistants entirely to ourselves, and I would therefore pray that this may be the case."(2) Nonetheless, by this time Tyndall had several friends on the Board, and despite the occasional difference of opinion with Bence Jones, they understood each other well.(3) However, Tyndall's relationship to the Managers never approached that mutual sense of loyalty and respect that had been the characteristic of Faraday's, and deserves to be borne in mind as one component in the changing pattern of the R.I.'s management in the 1860s.

The Secretary together with the resident Professor bore the burden of the day-to-day running of the Institution. The most important occasions in the administrative calendar were the regular Managers' Meetings, when all matters of policy and details of administrative business were dealt with. This part of the management structure did not change in

(1) Tyndall to Bence Jones, 4 Jan 1866, (Tyndall, Correspondence, 15/G7.7).
(2) Ibid. This incident was caused by an unfavourable review by Tyndall's laboratory assistant, W.F. Barrett, of a new edition of Elements of Physics (1865) by Neil Arnott, M.D., who discovered the writer and thought that Tyndall had instigated the review. Arnott's friend, J.P. Gassiot Jr., an R.I. Member, complained vociferously to the Managers (J.P. Gassiot to the Hon. Secretary, 1 Jan 1866, Box 188a), but they refused to become involved (Man.Min., XII. 131-3 (5 Feb 1866)). J.P. Gassiot Sr., a Manager at the time, appeared unperturbed by the affair, although his son resigned from the Board of Visitors on which he was serving at the time.
(3) Investigationhas shown only one other occasion when Bence Jones and Tyndall disagreed violently, over Tyndall's article 'On Miracles and Special Providence', Fortnightly Review, 1 n.s. (June 1867), 645-60. Tyndall tended to over-react to any criticism, and the complaints voiced in his Journal should not be taken too seriously (Journal VIIIa, p.416 (11 June 1867)), as the numerous friendly letters between them contradict any impression of hostility.

essence throughout the years under discussion, and Managers' Meetings took place once or twice a month between the end of November and the beginning of July. Important business however had always been handled by small committees, both standing, in the shape of the Committee of Accounts, and ad hoc, for such matters as building alterations, legal points, or to sort out specific difficulties. The number of committees indeed declined somewhat in the 1860s, as did the number of Managers' Meetings, but this can probably be accounted for simply in terms of efficient direction. Bence Jones was certainly an efficient administrator, and he regarded a Board of fifteen men as cumbersome, causing delays if each one had to be consulted. As he complained to Tyndall as early as 1853, "it is not easy with many managers to get every thing done quickly".(1) It is not surprising to find that Bence Jones appears to have felt less obligation than his predecessor, the Rev. John Barlow, to consult the Managers on minor issues.

There was however one area of the Institution's administration which demanded urgent attention if the R.I. was to become a coherent, unitary body able to carry out its desired objectives. Important changes were made in this respect, and an examination of the R.I.'s organisation in 1840 and again in 1870 sums up the principal developments (see Charts 1 and 2). A radical simplification of the structure was achieved by the disappearance of the two other bodies which in the 1840s had management functions, the Patrons of the Laboratory and the Patrons of the Library. For in 1840 the R.I. was still a collection of several theoretically independent entities, as the Library in particular demonstrates. The Library had been set up in 1803, soon after the foundation of the R.I., when it was still a proprietorial body.(2) It was formed as a subscription

(1) Bence Jones to Tyndall, 11 Apr 1853, (Tyndall, Correspondence 14/F3.13).
(2) Man.Min., III. 114-19 (21 Mar 1803).

Chart 1

The Royal Institution : 1840

(1) Faraday from 1833 was Fullerian Professor of Chemistry. (see Appendix I) Lecturing professors, such as the Fullerian Professor of Physiology, took no part in the administration and have therefore been omitted.
See p.84 for 1870 Chart.

library with proprietors paying £100 for certain privileges as "Patrons of the Library".[1] Thereafter it was run in a semi-independent fashion by the Patrons, and was as much an unusual mixture as its parent body, the R.I. itself; in constitution a subscription library, in administration a proprietorial concern, while also remaining an important part of the R.I. in a formal institutional sense.

This anomalous situation was reflected in the Institution's finances. Disbursements were made by three separate bodies, each in part administered by different people, namely the Laboratory, the Library and the General Funds. The general income of the Institution, which came principally from Members' subscriptions, was apportioned between the three funds on a fixed basis: 1 gn. from every annual subscription, or 10 gns. from a life subscription, went to the Laboratory fund; the admission fee of 5 gns. from a new Member's annual or life subscription was allocated to the Library account. Certain expenses were deemed to fall exclusively on these two accounts, including Brande's salary as Professor of Chemistry and Faraday's salary as Director of the Laboratory on the Laboratory account, and the salary of the Keeper of the Library on the Library account. It is not known whether in the 1840s all the accounts were kept at the same bank, but certainly in the 1850s the Library account was kept at Scott & Co., whereas the R.I. general account was kept at Drummonds.[2] The treasurer of both Library and Laboratory Funds was Benjamin Bond Cabbell, mentioned earlier as a barrister, country gentleman and patron of the arts. Since Cabbell served as a Manager continuously from 1826 to 1848, and was also a member of the managerial Committee of Accounts, there was presumably little difficulty posed by the separation

(1) See Report by the "Committee on the Constitution and management of the Library" (Man.Min., IX.443-50 (15 Mar 1847)), which gives a brief history of the Library. The subscription fund was exhausted by 1808, and the Library was thereafter dependent on a fixed allocation from Members' subscriptions, and subventions of £50 from the Managers "from time to time" (R.I. Bye-Laws, chap.xx, art.5).

(2) The Patrons' Minutes (III.333-4 (2 Apr 1851)) resolved that all monies should be paid into Cabbell's account at Scotts, but it is not clear from the context whether this was a new move or not.

of the various accounts.

In 1846 however the discovery of frauds by the assistant secretary, Joseph Fincher, precipitated a change.(1) Fincher used the system of allocating a part of each Member's subscription to different accounts to hide his embezzlements, and the independent nature of the Library accounts in particular had provided excellent cover.(2) The day-to-day accounting was greatly tightened up,(3) and the whole financial administration looked at afresh. The Visitors, who acted in this respect as auditors, were well aware of the anomalies of the system and recommended bringing the accounts of the "three branches of the Institution under one general head."(4) They also severely criticised the Library's management, stating that its

> constitution is wrong in principle and bad in practice, and has been one reason why the Library has long since come to a complete stand still, absorbing a good portion of the admission fees, and a yearly contribution of money besides, from the General Fund, without being enriched as far as the Visitors have been enabled to ascertain, by many modern works of importance, for some years past. The Visitors feel no hesitation in telling the General Meeting, that unquestionably this department demands reformation. (5)

Reformation however did not prove to be a straightforward affair. In January 1847 a committee consisting of three Managers, one Patron of the Library, and two Managers who were also Patrons, was formed to investigate

(1) The embezzlements were discovered in July 1846 as a result of a decision to change the format of the accounts by drawing up a simplified statement of account, discharging all liabilities for the previous year, in order to see the exact financial position (Man.Min., IX. 384-6 (20 Apr 1846)).
(2) Fincher was responsible for allocating the right amount from each Member's subscriptions to the various accounts. Instead of giving a receipt from the properly bound volume of receipt slips, which had numbered counterfoils, Fincher gave a receipt from a set of unbound slips, and kept the money. He was also not accounting for the Petty Cash properly (Report of Managers' committee investigating Fincher's defalcations, Man.Min., IX. 398-402 (17 July 1846)).
(3) Man.Min., IX. 452-4 (20 Mar 1847).
(4) Ibid., IX. 456 (5 Apr 1847).
(5) Visitors' Annual Report (1846), entered in Man.Min., X. 9-10 (17 May 1847), repeated X. 44-5 (15 Nov 1847).

the "formation, constitution and management" of the Library.(1) The Committee proved unable to agree on the extent of their powers of investigation, and was therefore revoked by the Managers, who then promptly reconstituted it so that it consisted of Managers only and all Patrons of the Library were excluded.(2) This reconstituted Committee duly reported to the Managers, and stated firstly that there were no specific provisions in the Bye-Laws for superintending or checking the Library accounts, but secondly, that the Managers did have supreme authority over all employees in the Library.(3) The Patrons however continued to assert that they had final authority over the Keeper of the Library, whose salary they paid. The Librarian's salary did indeed appear in the Library statement of account, but as the amount advanced to the Patrons from the Managers from 1840 to 1845 was never less than £150, more than covering the Librarian's salary of £110, the Managers had some grounds for their assertion.(4) In May 1847 a further Committee was appointed to "consider the difficulties that appear to exist in the relations of the Managers, and the Patrons".(5) This Committee consisting of three Managers and one Patron, divided equally over the question of the Managers' rights, one of the Managers siding with the Patrons.(6) With the failure of these conciliatory efforts, the Managers then decided to go ahead and revise the Bye-Laws as necessary, and appointed yet another committee to recommend the appropriate changes,(7) and also to

(1) Man.Min., IX. 431 (11 Jan 1847).
(2) Ibid., IX. 437-8 (15 Feb 1847). One Manager, George Moore, the architect, was also a Patron of the Library, but his loyalty to the Managers never seems to have been in doubt.
(3) Ibid., IX. 443-50 (15 Mar 1847).
(4) Statement of Accounts for the Library and Mineralogical Fund, 1840-45, Visitors' Annual Reports, 1840-45.
(5) Man.Min., X. 10 (17 May 1847).
(6) Ibid., X. 12-14 (31 May 1847). W.R. Grove and William Pole asserted the Managers' rights over the Library. W.V. Hellyer (Secretary to the Patrons) and W.S. Walford, both lawyers, denied the Managers' rights. Walford was not re-elected to the Board of Managers again after 1847.
(7) Ibid., X. 31-33 (24 July 1847).

apply financial pressure on the Patrons by withholding their normal allocation of monies. The usual hiatus then occurred between the end of the season in July and the time in November when Managers' Meetings met once again. By this time the Patrons were unable to meet their bills, and their requests for money from the Managers were met by the curt reply that the Patrons should transmit their unpaid bills to the Managers for settlement, which would thereby acknowledge the latter's authority.(1) Finally, in February 1848, the Bye-Laws were amended by the General Monthly Meeting, with twenty-four Managers and Visitors present out of a total of fifty-five people at the meeting, in an unprecedented show of strength to force through their resolutions.(2) The Patrons however stubbornly refused to accept defeat and sent circulars to the Members attacking the Managers' "violation of the right of property".(3) In March 1847, at the following General Monthly Meeting, prolonged argument necessitated an adjournment.(4) The adjourned meeting, which was chaired by Admiral Sir Edward Codrington, the victor of Navarino, passed off quietly and the Managers repulsed the Patrons' attack.(5) However, it was not until another month had passed with a final twist of the financial thumbscrew, that the Patrons gave in and sent their bills to the Managers for payment.(6)

Why did such a basically simple administrative re-organisation arouse so much hostility? Part of the answer concerns matters of principle, and part concerns personalities, for had not two of the Patrons

(1) Ibid., X. 38 (1 Nov 1847), 44-5 (15 Nov 1847).
(2) Gen.Min., V. 395-400 (7 Feb 1848).
(3) Printed statement of 26 Feb 1848, signed by B.B. Cabbell and W.V. Hellyer, inserted in Minutes of the Library Patrons, III. pp.317-18.
(4) Gen.Min., V. 404-6 (6 Mar 1848).
(5) Ibid., V. 408 (13 Mar 1848).
(6) Man.Min., X. 80 (3 Apr 1848). The Managers paid the bills with the exception of subscription to the circulating library, and sent the Patrons a tart little note telling them not to incur liabilities beyond their means of payment. They also continued to withhold the normal allocation of monies until the end of the year, and then only handed over the balance after payment of the Library staff salaries (ibid., 79-81).

decided to resist the Managers, it is probable that the reorganisation would have been accomplished without difficulty. The Patrons' opposition was led by Cabbell, and by the Secretary of the Patrons, William Varlo Hellyer. Cabbell's literary and scientific interests have already been mentioned. Less is known about Hellyer, except that he too was a barrister, and served as a Manager continuously from 1832. However, in contrast to Cabbell, on who occasion appears to have sat on the fence,(1) Hellyer's voice comes stridently through the formal anonymity of the Managers' Minutes. He repeatedly asked for money, wanted to know what grounds the Managers had for their actions, and vigorously defended the Patrons' rights of property as embodied in the constitution of the Library.(2) It is worth remembering too that Hellyer had been proposed as Secretary to the R.I. in 1843 after Daniell's resignation.(3) Had Hellyer and not Barlow been chosen, it is possible that the Library would not have been brought under the Managers' control, and indeed the Institution might well have taken a quite different direction away from experimental research, or perhaps have foundered on the rocks of managerial ineptitude.

Hellyer and Cabbell's opposition was based on the argument that they had purchased an interest in the Library and should therefore enjoy the privileges of their property and exercise control over its affairs.(4) The Library to them was first and foremost a proprietorial concern, no matter what its relationship was to the rest of the Institution that housed it. This independence meant that those of the Patrons who were active in its management had only their own tastes and interests to

(1) For example, Cabbell did sign the Managers' proposal to alter the Bye-laws which concerned the Library (Gen.Min., V. 391 (6 Dec 1847)).
(2) Hellyer is mentioned by name in most of the Patrons' requests for money. He also wished to examine the early Managers' Minutes to draw up a statement of the Library's constitution, and then accused Barlow of preventing him seeing the Minutes, see for example, Man. Min., X. 55 (17 Jan 1847), 58 (24 Jan 1847), 59-61 (7 Feb 1847).
(3) Man.Min., IX. 239 (9 Jan 1843). Cabbell was proposed by W.R. Hamilton, but declined for lack of time.
(4) Statement of 26 Feb 1848, quoted above, p. 77, n.3.

consult. Apart from Faraday (who was not an active Patron), there was only one other Patron who was a scientist, Edward Solly, the chemist, and he was also an antiquarian booklover.(1) The other Patrons were aristocrats (Lord Palmerston, the Duke of Somerset), lawyers (E.R. Daniell, L.H. Petit), medical men (S. Solly, C. Holland), or gentlemen of no particular occupation.(2) Few indeed took any part in the Library's management; Hellyer, Cabbell and a certain William Adams Smith were the most active,(3) and clearly the emphasis of the Library's contents had ceased to accord with the increasing scientific reputation of the Institution of which it was part.(4)

The principle at issue however during 1847 and 1848 was financial control rather than accessions policy. This was essential to the Managers, for they could not allow the possibility of fraud to occur again through the intransigence of a few men who sat year after year on the Board.(5) Once control had been won in principle, it was secured in practice by the appointment in the person of Benjamin Vincent of a new Librarian who would be entirely loyal to their interests. Vincent had recently been appointed

(1) Edward Solly (1819-86), Professor of Chemistry at the East India College, Addiscombe, from 1845-49; owned a large antiquarian library, and was Treasurer to the Index Society from 1878-83 (D.N.B., Atheneum, (1886), pt.1. p.489). He only became active as a Library Patron from October 1847, but joined Cabbell and Hellyer in opposing the Managers (Minutes of Library Patrons III. 1847-48).
(2) 'Patrons of the Library', listed after the Managers and Visitors in the annual Membership Lists.
(3) 'Return', compiled by Rev. J. Barlow, of Patrons who attended meetings (Man.Min., X. 87-8 (17 Apr 1848)).
(4) See Visitors' Annual Report (1846) quoted above, p. 75.
(5) The continued presence of Cabbell and Hellyer appears to have affronted the other Managers even before the dispute over the Library. This appears to have been the reason for a change in the method of selection of Managers for re-election to the Board in 1845. It was suggested that the two senior members of the Board (who were Cabbell and Hellyer) "shall under all circumstances retire" (Man.Min., IX. 334 (21 Apr 1845)). The motion was opposed by Cabbell and Hellyer without success, but an amendment put by Cabbell was carried, that the rule should not apply to the Treasurer of the Library and Laboratory Funds (i.e. himself) "if he be a manager" (ibid., p.340). This amendment was however not confirmed at the following Managers' Meeting (ibid., IX. 342 (1 May 1845)), although it was not until 1848 that Cabbell was omitted from the list for election.

assistant-secretary, and in December 1848 was entrusted with the post of Librarian as well.(1) He was a close friend of Faraday, connected to Faraday's family by marriage, and moreover like him a Sandemanian by religion.(2) His loyalty was therefore unshakeably guaranteed. In his dual role of assistant-secretary and Librarian, Vincent was as closely involved in the day-to-day running of the Institution as it was possible for any man to be. He was present, though unnamed, at Managers' Meetings to take down the minutes,(3) and his reports to the Managers on the Library became increasingly frequent. Furthermore, from 1851 the Managers appointed annually from among their number a Library Committee of between four and seven members to advise on the purchase of books.(4) This Committee was, as one might expect, dominated by those influential scientific men who formed the hard core of the Institution's management in this period. W.R. Grove, Charles Wheatstone, Colonel Yorke and J.H. Gladstone invariably served as members. W.F. Pollock was equally constant a member, but the literary element was quite outnumbered by the scientific. Accessions policy as well as financial control was thus properly under managerial control, and the Library became thoroughly knitted into the fabric of the management.(5)

Yet there was a compromise here, for the Patrons continued to exist, although as an emasculated body permitted only to purchase books with

(1) Man.Min., X. 95 (8 May 1848), 144 (4 Dec 1848). He was appointed assistant-secretary on Faraday's recommendation.

(2) See the letters from Faraday to Vincent which always start "My dear friend" (Williams, Selected Correspondence, ii. 585-6, 640-1, 974-5, 1016-8). These letters speak only of family and Church matters. Vincent's aunt married Robert Faraday, brother of Michael, and Vincent himself married Ellen Barnard, niece of Mrs. Faraday, as his second wife (obituary in The Times, 5 May 1899).

(3) The earliest surviving Draft Managers' Minute Book, covering the period 17 Jan 1848 to 4 Nov 1850, is written in Barlow's hand until mid 1849. An outline draft is then written in Vincent's hand, with whole sections inserted by Barlow, but from May 1850 Vincent wrote more or less complete drafts, which were then corrected by Barlow.

(4) Man.Min., X. 324 (5 May 1851). Thereafter it became a standing committee, with its members chosen annually at the first meeting of the newly elected Board of Managers.

(5) See below, pp.243-54, for discussion of the character of the Library.

what money was allowed them by the Managers after all salaries and expenses in the Library had been paid. The Patrons could not be abolished without expensive amending legislation to the 1810 Act of Parliament, but there was nothing in the Act which detailed their rights over the Library, and the Managers could simply have cut off the supply of money altogether. They preferred however to let the passage of time do its work. The Patrons themselves appear to have temporarily lost interest after their defeat, and there is a gap in their Minute Book from June 1848 to April 1851.(1) Thereafter meetings were held no more than once or twice a year. But it was not until twenty years after control had been won by the Managers, that the Library account was finally incorporated into the general account. In 1868 no money was paid over to the Patrons, and the following year the remaining balance on the Library account was cleared.(2) Even then compromise with custom persisted, and from 1868 the Managers' Library Committee held joint meetings with W.A. Smith, the only surviving active Patron, to organise the details of payments and purchases.(3) When Smith died in 1870, the last vestige of proprietorial interest disappeared, and the Library finally became an institutional library proper.

Likewise the finances of the Laboratory were also incorporated into the Institution's general account. There had indeed never been any quarrel over the internal administration of the Laboratory under Faraday's direction,(4) and the Patrons of the Laboratory do not appear to have had the same powers as in the Library. Cabbell was once again the Treasurer of the Laboratory Fund. However, the laboratory accounts were

(1) Minutes of the Library Patrons, III.
(2) Statement of Account (1869). This followed the fusing of the three funds, see below, p.82.
(3) Volume entitled 'Minutes of the Library Committee 1868-71', headed inside, 'Joint meetings of the Patrons and Library Committee'. See also Man.Min., XII. 248-9 (6 Apr 1868).
(4) Except where its activities concerned the Members, as in the case of the Laboratory Lectures, see below, pp.142-7.

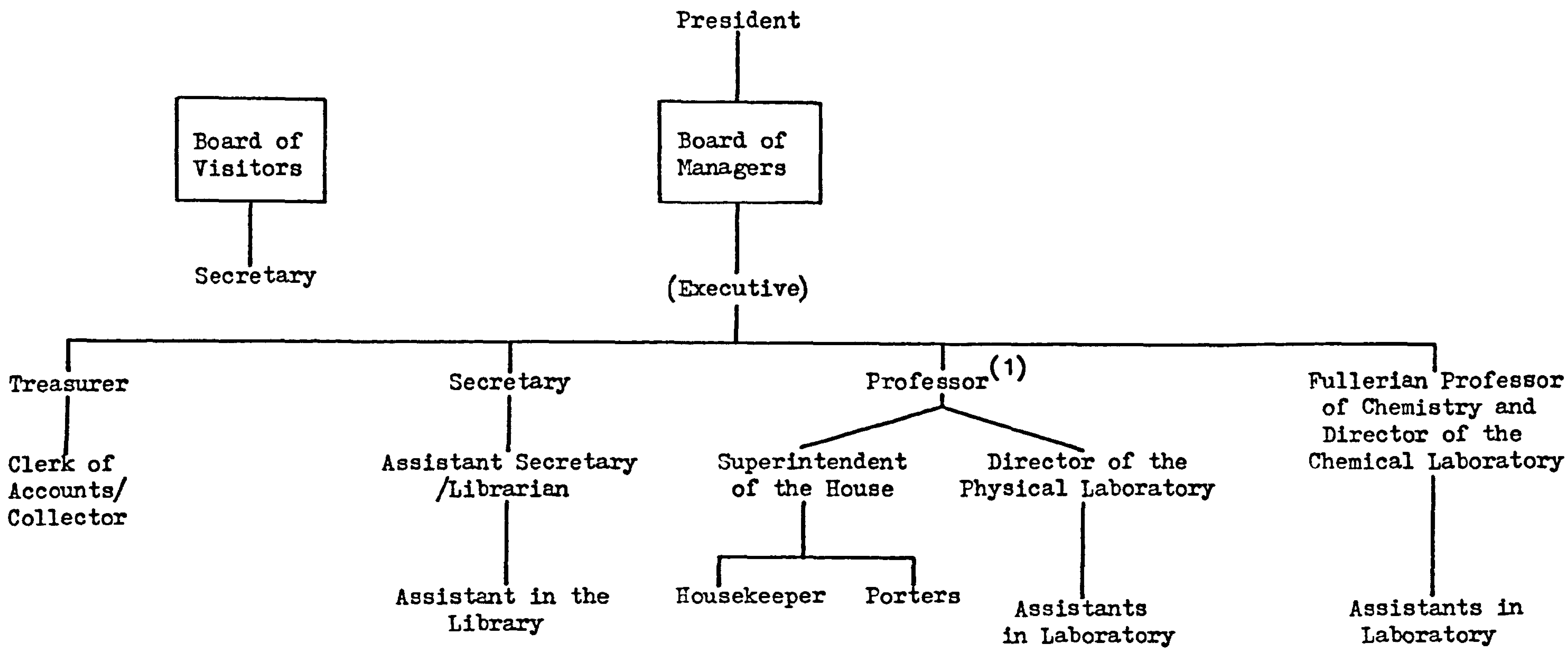
dealt with along with the general finances by the standing Committee of Accounts, which recommended bills for payment to the Managers' Meeting, without reference to the Treasurer of the Laboratory, although indeed each page of the laboratory account book is headed from 1832 onwards "Benjamin Bond Cabbell Esq., in account with the Laboratory Fund".(1) Only on rare occasions was the Treasurer of the Laboratory specifically "empowered to pay" certain bills.(2) Unlike the Library, however, the Laboratory had two capital funds. One fund dated from 1824, and was invested as was normal at that time, in the names of four trustees, of whom Cabbell was the only survivor by 1860.(3) The money in this first part was a smaller sum (£863), and appears to have been left to mount up. The second fund, dating from 1830, was invested generally in the name of "The Members of the Royal Institution of Great Britain", and therefore under the direct control of the management. In 1861 the trusteeship of the various funds, of which there were eight altogether including the Fullerian endowments, was sorted out, and Cabbell was requested to hand over the monies of which he was trustee, so that the two parts of the Laboratory Fund could be merged.(4) Finally, in 1868 all Bye-Laws relating to the financial allocation of subscriptions in support of both the Library and Laboratory Funds were repealed, and the accounts fused into the R.I. general account.(5)

(1) R.I. MSS. Laboratory Accounts, I. 1824-64. This volume contains details of money received from subscriptions, and payments made. There are no confirming signatures. The Minutes of the Committee of Accounts, II-IV, show the Committee examining the accounts of the Laboratory Fund, and recommending payment of bills to be made. These recommendations were presented to the Managers' Meeting, and appear regularly in the Minutes following the general accounts.
(2) For example, the salaries of Faraday and his assistant, Sergeant Anderson (Man.Min., XI. 344 (2 July 1860), 382 (1 July 1861)).
(3) <u>Report of the Treasurer of the Royal Institution</u> (1 July 1861), a copy of which is bound in the Managers' Minutes, XI. 383. See p.2, 'Fund (B)'.
(4) <u>Ibid</u>., p.7, and Man.Min., XI. 383-5 (1 July 1861).
(5) Man.Min., XII. 229-30 (3 Feb 1868), 241-3 (16 Mar 1868), 246-7 (6 Apr 1868).

The financial arrangements may therefore be regarded as having become by that date the effective instrument of a unified administration, as opposed to reflecting the disjointed nature of three semi-independent entities whose chief link was their common location in the same building (see Chart 2). The framework was provided for a research institution which was thoroughly modern by the standards of the day. More than anything however, this reorganisation was a reflection of the redirection of the R.I.'s energies that took place, as its resources were directed towards experimental scientific research, its most lasting claim to fame. Such a redirection could hardly have taken place had there not been a fundamental change in the composition of the management, with the amateurs of an older tradition replaced by professional men, as occurred in so many similar organisations of the period. Moreover, the majority of these professional men were men of science with a professional scientific training and with many scientific achievements to their names. Their work was indeed generally pursued outside the formal career structure of science in Government or academic circles, but they provided that essential support for the energetic Secretary of the 1860s, Henry Bence Jones. The definition Bence Jones and his colleagues gave to the objective of scientific research at the R.I. was to fix the future direction of the Institution; and the nature of their definition was itself largely the result of their own background and position in the organisation of science at that time.

Chart 2

The Royal Institution : 1870



(1) Tyndall, Professor of Natural Philosophy, took over the resident professor's duties in 1867 following Faraday's death.

Chapter 2

The Membership

Scientific memoirs of the nineteenth century contain an abundance of references to the R.I. as a "highly fashionable institution" and to its "brilliant audience".(1) It is not surprising that the impression has survived that the R.I. throughout the century was patronised chiefly by the aristocracy and upper echelons of fashionable London society. There had indeed been a sharp change at the beginning of the nineteenth century when classes for mechanics were dropped in favour of lectures which kept "fashionable London abreast of the progress of science".(2) First of all a distinction must be made between Members of the Institution, who paid their annual subscriptions regularly, and those who were merely invited on occasion to attend a Friday Evening Meeting, or those who had simply paid for a ticket to attend a Course of Lectures. These latter will be discussed in chapters 4 and 5; only paid-up Members are considered here. A study of the membership throws much unexpected light on the history of the Institution. In the first place it provides a detailed picture of the people who were Members and loyal supporters of the R.I., as opposed to the generally accepted picture described above of a fashionable, upper-class society, a characterisation which must on investigation be greatly modified. This knowledge may then illuminate their motives for joining the R.I., and in a larger context elucidate some of the goals, values and assumptions of one section of nineteenth century society. It reveals too how the Institution fulfilled the same needs as other learned societies, by providing social occasions for people to meet together, as well as opportunities for social and

(1) B.H. Becker, Scientific London (1874), p.43; diary of A.C. Ramsay (1814-1891), geologist, for March 1850, cited in Geikie, Ramsay, p.159.
(2) C.C. Gillispie, Genesis and Geology (1959), p.29.

professional advancement alike. Finally, any discussion of the membership of an institution should include some scrutiny of the formal relationship of Members to the management, their relationship to the main objectives of the R.I., and the ways in which they were involved in the conduct of the Institution's affairs.

The R.I. in the mid-nineteenth century was among the larger London societies. In 1851 the largest (excluding purely professional associations) was the London Institution which had a membership of 2,000.(1) It was followed by two of the natural history societies, the Zoological with 1877 members and the Royal Botanic Society with 1216 members.(2) Next came the Society of Arts with 1092 members.(3) Below these societies, with numbers ranging between 700 and 900 may be listed the Royal Society, the Society of Antiquaries, the Geological and the Royal Geographical Societies, and it is within this range that the R.I. should be included.(4) All the other London learned societies were considerably smaller, and one is thus dealing with a substantial number of people at the R.I.

The R.I.'s total membership increased over the period under discussion here.(5) This was not a smooth progression; after rising steadily throughout the 1830s, the membership declined in the 1840s, showing a 5% decrease during that decade. From 1850 the upward movement was resumed, despite a sharp dip between 1854 and 1856 which may probably be attributed in large part to the Crimean War which

(1) Census of Great Britain 1851, Education: 'List of Literary and Scientific Institutions from which returns were procured', Parl. Papers, 1852-53 [1692] XC.1. pp.215-18.
(2) Hume, op.cit., pp.96, 106. These two societies do not appear in the Census return.
(3) Hume in 1847 gives the Society of Arts only 830 members (op.cit., p.100), whereas the larger figure cited above is that given in the Census return for 1851. This is one of the few occasions when Hume's figures differ substantially from those of the Census. Hume does not appear to have updated his figures for the 1853 edition of his book.
(4) Census of Great Britain 1851, Education: p.216; Hume, op.cit., passim.
(5) There was also an inferior class of member called an "annual subscriber", whose privileges were the same as those of Members, except that they were barred from the Friday Evening Meetings. In 1840 there were only thirty-four annual subscribers, in the 1860s between two and five, and none by 1870. They have therefore been excluded from the analysis of the membership.

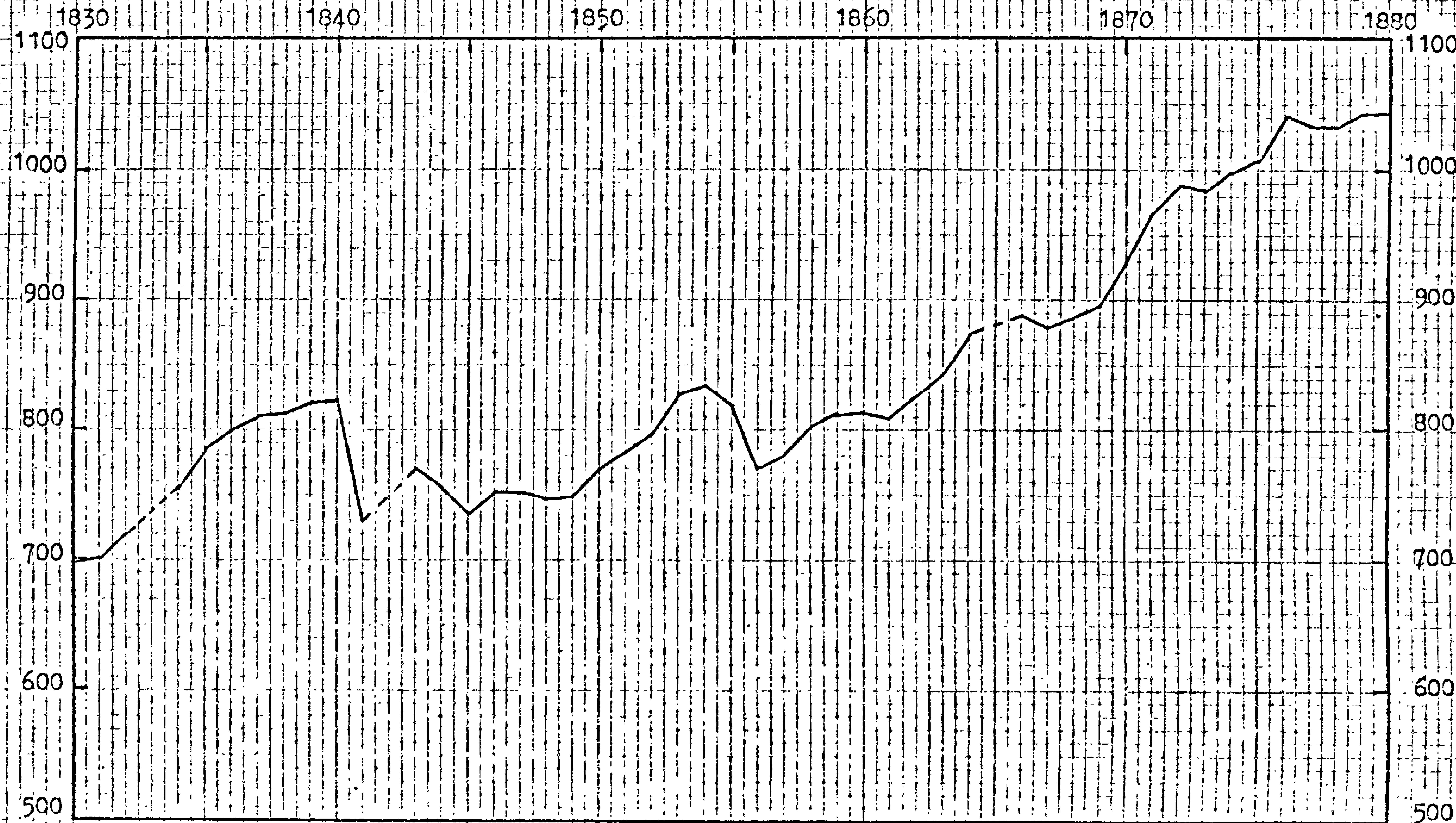
took many of the Members who were in the forces overseas.(1) The membership steadily increased, showing a marked rise of 15.6% during the decade of the 1860s (see Graph 2). Considering the increased number of scientific societies flourishing by that time, the R.I. did well to increase its membership so substantially. The non-specialised society did not necessarily suffer at the expense of the new specialised society.

The usually accepted image of the R.I. as a predominantly aristocratic society proves to be a misleading one. On investigation the R.I. presents the same varied spectrum of society as many other metropolitan learned societies. Furthermore, it is instructive to see in broad terms how limited was the change in the social background of the membership over the period under discussion, bearing in mind the increase in the total number of Members. There are however certain drawbacks in the nature of the material which should be indicated. The main source of information is the Membership Lists, but these are incomplete and at times inaccurate. In the earlier Lists, dates of joining are omitted and addresses are frequently lacking. Identification is inevitably sometimes uncertain. It is clear too that Members were often not removed from the lists until some time after their death, or withdrawal, or until the arrears of their subscriptions had become considerable.(2) The Membership Lists are therefore never completely accurate. Nonetheless, for the purposes of this study, these defects are unlikely to distort conclusions significantly. Secondly, it has been possible to identify only 61% of the Members in 1840 as opposed to 80% in 1870, and a comparison between the two may be unbalanced. One may however set certain limits and ascertain that those still unidentified were not professional

(1) The withdrawal or decease of a Member was not reflected in the Membership List until the following year.
(2) Inaccuracies tended to occur when Members had compounded for their annual payments; for example, James Broadwood, the piano-maker, died in 1851, but was not removed from the Membership List until 1871. This is however the most striking example so far uncovered.

Graph 2.

R.I. Membership 1830-1880



Source: Membership Lists 1830-1880.
No figures available for 1842 and 1865.
List for 1832 is incomplete.

men such as doctors, surgeons, barristers or engineers.(1) Nor were they from the peerage or baronetage, or they would automatically have been identified, and therefore the large proportion of unidentified Members cannot invalidate the conclusion, namely that the image of the R.I. as an aristocratic society is misleading, for the "Society" element in the membership itself was a small one.

The proportion of Members from the aristocracy was 4.4% in 1840 and decreased slightly from that time. Aristocracy and gentry together formed just over 14% of the total in 1840, and dropped a little by 1870. There were indeed a number of peers on the Membership List, and, as to be expected, this has tended to exercise a disproportionate effect on the general image of the Institution, as it does not require many aristocratic names to create the impression of an elite and prestigious society. It is more revealing to see who formed the major body of the membership. The most important groups were those from the professions, above all from the law and medicine. Both increased their position slightly over the period, forming together by 1870 22% of the total. The number of people with a professional interest in science, such as engineers, rose somewhat, but not more than one would expect. A more significant change can be seen in the large increase in the number of businessmen, even allowing for a number unidentified in 1840, who by 1870 formed 11% of the total. It is thus clear that the image of the R.I., both in the eyes of contemporaries and of later historians, as an aristocratic and upper-class society, is not an accurate one as far as its paid-up Members were concerned, either at the beginning or at the end of this mid-Victorian period (see Table 3). The core of the Members was thus formed by professional people, some indeed from the very top

(1) Such men would be readily identified by the professional qualification printed after their names, or through the Commercial and Trades sections of the London Post Office Directory, the Law List, or the various medical directories, all of which have been used to assist in identification.

Table 3 Analysis of Membership [1]

	1840	1870
	%	%
Aristocracy	4.4	3.6
Gentry	9.9	8.5
The Law	10.6	11.7
Medicine	8.2	10.4
The Church	3.8	3.8
Army and Navy	6.0	5.5
Business	5.2	11.1
Chemists	1.0	1.0
Engineers	1.4	3.3
Women	0.6	5.1
Men of science	2.1	3.4
Other identified	8.2	13.1
Unidentified	38.6	19.5
	100.0	100.0

(1) Identifications have been based on the relevant directories, biographical dictionaries, or on the description entered on the prospective Member's certificate which was entered in the Minutes of the General Monthly Meetings. Double entries have been avoided, and for example a physician created a baronet appears only under medicine. The category "Business" includes bankers, merchants, brokers, brewers, distillers, but not manufacturers and industrialists. The latter were in any event very few in number, 0.7% in 1840 and 1.1% in 1870. "Chemists" included wholesale, operative and pharmaceutical chemists, and likewise "Engineers" include all types, whether civil, electrical, mechanical or railway. "Others identified" include artists, architects, scholars, antiquaries and so forth, who are discussed further in the text. However, 4.1% of this category in the 1870 List described themselves as "private gentleman", that is, a person "not holding public office or position" (Murray, N.E.D.,VII.ii.1388). This description was first used in 1839 (Certificate of B.G. Windus, Gen.Min., V.54 (6 May 1839)), and more and more frequently as the years passed. It appears to have been rather a claim to status than a reliable guide to occupation, as this description appears on the certificate of, for example, J.F. Bateman, a successful engineer who joined the R.I. in 1863, and Henry Doulton, the pottery manufacturer, later knighted (1887), who joined the R.I. in 1870. Where such "private gentlemen" have been otherwise identified, they have been placed in the appropriate category, and the figure of 4.1% quoted above, comprises only those of whom nothing further is known.

of their profession, but most from the middle ranks. Moreover, throughout this period a downward movement in the social background of the Members can be discerned, a trend which was similarly experienced by other societies, even in such an old and prestigious society as the Antiquaries.(1) The preceding analysis has focused primarily on the old established professions, but by 1870 the middle-class element was increased by the addition of people from the new professions, who could better be described as belonging to the "middling classes", and aspiring to acceptance by the old-established professional middle classes.(2) Such people included school-masters, dentists, actuaries, veterinary surgeons, opticians and surveyors. The certificates of new Members show an ever increasing number of examples such as W. Field (veterinary surgeon, 1846), Thomas Rushton (school-master, 1854), J. Clutton (surveyor, 1857), G. Mathey (assayer, 1857), A. Andresen (school-master, 1862), J.W. Stephenson (actuary, 1862), F.W. Gingell (factor, 1863), J.D. Dallmeyer (optician 1870).(3)

Furthermore, while the upper crust of the City business community were present in the person of prosperous bankers like the Hoares and Lubbocks, and old established brewers such as the Barclays,(4) there is a strong impression that as the century progressed men were to be found among R.I. Members who were engaged in much humbler capacities or in less socially acceptable forms of business than the time-hallowed trio of banking, brewing and distilling. The only person in this period who was proposed for membership but failed to be elected was John Rogers,

(1) Evans, <u>op.cit.</u>, pp.263-4, 294.
(2) For a model of class structure and the place of the "middling classes", see R.S. Neale, 'Class and Class-Consciousness in early nineteenth-century England: Three Classes or Five?', <u>Victorian Studies</u> (Sept 1968), 4-32.
(3) Gen.Min., V.303 (6 Apr 1846), VI.129 (8 May 1854), VI.230 (2 Feb 1857), VI.231 (2 Feb 1857), VI.485 (7 July 1862), VI.487 (3 Nov 1862), VI.505 (2 Feb 1863), VII.277 (5 Dec 1870).
(4) In 1840 three of the Hoare family, three Barclays and one Lubbock were Members. These families continued to be faithful R.I. supporters, several of the younger generation joining in the 1860s and 1870s.

merchant and warehouseman, in 1842.(1) No explanation survives, and it may even have occurred by error, but perhaps his business was considered in some way to be not acceptable. It was only indeed from 1839 and 1840 that people began to be identified by status (as gentleman or peer's son) or occupation on their membership certificates, suggesting perhaps that it had by that time become necessary to vet prospective Members.(2) The appearance too of names such as C. Urano ("foreign corresponding clerk with Messrs. Twining", 1849), D. Oldfield (wholesale druggist, 1852), S. Spalding (wholesale stationer, 1865), C. Southwell (manufacturing confectioner, 1871),(3) together with the considerable number of Members in 1870 who were colonial brokers, produce brokers, stock brokers, warehousemen, may provide some evidence that institutions such as the R.I. now readily opened their doors to the smaller man of business whose operations were not on such a grand scale as to sweep away all barriers before them, such as the notorious company promoter, Albert Grant ("Baron Grant"), who became a Member in 1864.(4) There was even one man who described himself in 1870 as a "prospector", although this may have been a joke.(5)

In addition, there was one constant theme throughout the period in question which should not be forgotten, and that was India. There was always a considerable number of people who had served in India with the Indian Army (often as engineers or surveyors), or the Indian Civil Service as doctors, surgeons, judges and lawyers. In this respect the R.I. was comparable to the other "eastern" societies, the Royal Asiatic

(1) Gen.Min., V.146 (7 Mar 1842).
(2) From the mid 1830s, only occasionally were prospective Members identified on their certificates. From 1840 the practice became general, even going so far as to identify clerics as "clerk" or "clergyman".
(3) Gen.Min., V.457 (5 Feb 1849), VI.41 (3 May 1852), VII.60 (5 June 1865), VII.279 (5 Dec 1870).
(4) Albert Grant (1830-1899), D.N.B.
(5) Gen.Min., VII.265 (6 June 1870).

Society (founded in 1823), the Oriental Club (founded in 1824), and one might also include the United Service Institution (founded in 1831).(1) The connection is shown by the frequent loans of objects from the Royal Asiatic Society and the United Service Institution for exhibition at the R.I. on Friday evenings, a topic that will be reverted to later.(2) It is possible that the R.I. was regarded as the scientific representative of the various oriental societies that a returning East India Company official might join. Certainly the R.I. was aware of the exigences of service abroad, and required no subscription if a Member was sent overseas, and the person was reinstated on the Membership List on his return, provided he renewed his annual subscription.(3)

Finally, in this general description of the composition of the membership, it must be emphasized how very small was the scientific element. Over the period it rose only from a tiny 2.1% in 1840 to a mere 3.4% in 1870, including R.I. Professors in that number.(4) The R.I. was therefore not at all a scientific society, however unspecialised, for scientists. Very few new Members throughout the period were scientists, and the rate at which men of science joined remained both low and remarkably steady: eight in the 1840s, ten in the 1850s, and eight in the 1860s. Few held professional or academic positions, and those that did frequently resigned after a period, such as John Percy, Professor of Metallurgy at the Royal School of Mines, who joined in 1854 and withdrew in 1863, or Alexander Williamson, Professor of Chemistry

(1) For these societies, see Hume, op.cit., pp.101-4; S. Wheeler (ed.), Annals of the Oriental Club: 1824-1858 (privately printed 1925). The United Service Institution was strictly speaking a more general society, formed to promote science and literature among members of the services, but its Journal contained much eastern material among the travel and military topics.
(2) See below, pp.263-70.
(3) Requests for exemption from payment due to absence abroad occur regularly in the Managers' and General Monthly Meeting Minutes, for example, Man.Min., IX.430-1 (11 Jan 1847).
(4) Brande and Faraday were Members in 1840, Tyndall and Frankland in 1870 ('Membership List', 1840 and 1870).

at University College, London, who could not it seems make up his mind, for he joined in 1850, withdrew, rejoined in 1853 and withdrew finally in 1854.(1) In the 1860s only two of the eight who joined held professional scientific posts: Edward Frankland, Professor of Chemistry at the Royal School of Mines, who became a Member on resigning his R.I. Professorship in 1864;(2) and A.H. Church, Professor of Chemistry at the Royal Agricultural College, Cirencester.(3) Spottiswoode, already referred to as the Treasurer of the R.I. from 1865 to 1873, was another who joined in the 1860s. Three more of the eight were gentlemen whose researches were supported by ample private means: J.W. Strutt, the physicist and future third Lord Rayleigh; W.E. Wilson, astronomer and physicist; and George Buckton, chemist and entomologist, who like Wilson maintained a private observatory.(4) The remaining pair were J. Norman Lockyer, the energetic astronomer and secretary to the Royal Commission on Scientific Instruction and the Advancement of Science (1870-76), and the ageing General Sabine, geophysicist and President of the Royal Society from 1861 to 1871.(5) The professors of University College, King's College, and the South Kensington complex were conspicuous by their absence. Such scientific Members as there were, were more often than not independent of the professional career structure of science, just as were almost all of the scientists among the Managers.

In short, the Members of the R.I. were drawn far less from the

(1) John Percy (1817-1889), D.N.B., and Appendix II.iii. Alexander Williamson (1824-1904), D.N.B., and Gen.Min., V.511 (4 Mar 1850), VI.66 (7 Feb 1853), VI.108 (6 Feb 1854).
(2) Frankland was Professor of Chemistry at the R.I. from 1863 to 1868, see below, pp.161-2, 166-7.
(3) A.H. Church (1834-1915), Who Was Who 1987-1916 (1920), p.136.
(4) J.W. Strutt, 3rd Lord Rayleigh (1842-1919), W.E. Wilson (1851-1908), and G. Buckton (1818-1905), see D.N.B. Rayleigh, a Manager frequently in the 1870s, later became Professor of Natural Philosophy at the R.I. from 1887 to 1905.
(5) J.N. Lockyer (1836-1920), General Sir Edward Sabine (1788-1883), see D.N.B. Sabine was also a Manager, see Appendix II.ii.

aristocracy and gentry than from the ranks of the professional middle classes. Some of these men were indeed at the very top of their profession, where success was sealed by a knighthood or baronetcy. The majority however came from the middle ranks, with only a sprinkling of the elite. In addition, the well-established professions were joined in ever increasing numbers by people from the new professions, whose social as well as professional status was extremely ambiguous as they struggled to gain professional recognition in these middle decades of the nineteenth century. This downward trend in social status may also be seen among businessmen - an important group - as men of the humbler sort joined the R.I. in growing numbers. There was always too a significant number of men who had served in India, which was scarcely favoured as a suitable location for a career by the upper-classes, but was rather the preserve of the adventurous middle-classes. Finally, the scientific element was in terms of the total number of Members quite insignificant.

Why did these people become Members of the R.I.? The reasons which led people to join an institution from which they did not receive any concrete return were bound to be varied, and were frequently not the activities to which the R.I.'s management attached most importance. One should certainly be wary of supposing that the Members attached any great weight to what in retrospect was the R.I.'s most important work, that is, scientific research. Although Bence Jones indeed told the Members often enough during the 1860s that their support of research was their most important contribution,(1) there is little evidence that such an enlightened note struck any answering chord among the Members. For them, the attraction of the R.I. appears rather to have been a combination of several quite different characteristics. Of these, the most significant were the Institution's ability to maintain the traditions

(1) See below, pp. 158, 163-4.

of a gentleman's philosophical society, and, while combining these traditions of Enlightenment patronage of science with newer utilitarian ideas on the usefulness of science, to comprehend within its non-specialist walls such a variety of science and superior knowledge in general as to appeal to a wider intellectual patronage than ever before. Besides these attractions peculiar to itself, at the same time the R.I. played the same social role as many other learned societies in the lives of their members, by giving them a meeting place which provided opportunities for social and for professional advancement alike.

The tradition of a gentleman's philosophical society was always strong. Patrons of learning, both scientific and literary, were to be found among the Members just as among the Managers and Officers. Such patrons were often aristocratic, whose interest in learning also included approval of the utilitarian applications of science. Most underlined their patronage by compounding for their subscriptions at a cost of 55 gns., as opposed to the annual 5 gns. In 1840 75% of the aristocratic Members had compounded, compared with the overall figure of 54% among all Members.(1) The names therefore of great magnates and old aristocratic families such as the sixth Duke of Devonshire, the third Marquess of Lansdowne, the seventh Duke of Argyll, as well as Whig figures such as Lord Holland, Lord John Russell and Lord Palmerston, ornamented the Membership Lists until their deaths.(2) Among those who did not compound for their annual payments, and whom one can therefore be certain continued to be genuinely interested in the R.I., one may note several who had a particular interest in the natural sciences rather than simply a general interest in learning, such as Lord Shaftesbury (who sent Faraday samples of adulterated flour for analysis

(1) 'Membership List' (1840). Compounded Members were indicated by an asterisk.
(2) 'Membership Lists', 1840 onwards.

in 1842),[1] and Lord Burlington, later the seventh Duke of Devonshire, who chaired the Royal Commission on Scientific Instruction and the Advancement of Science.[2] It is noticeable however that the total number of people who compounded for their annual payments dropped from 54% in 1840 to 32% in 1870. Of aristocratic R.I. Members in 1870, only half had compounded, and two-thirds of those had done so before 1846, suggesting that this form of patronage was on the decline.[3] This assumption is supported by the decrease in the overlap in membership with other learned societies especially favoured by upper-class patronage, such as the Society of Antiquaries. In 1840 just over 10% of the R.I.'s Members were also members of the Society of Antiquaries, but by 1870 the figure had dropped to only 2.9%.[4] Likewise, fewer R.I. Members were to be found among that select body devoted to classical learning and archeology, the Society of Dilettanti. The Dilettanti were limited to seventy members, and in 1840 fifteen of that number also belonged to the R.I. But in 1870 only six R.I. Members also belonged to the Dilettanti (with one possible addition, whose identification is uncertain), of whom one had featured in the 1840 list, and a second was W.F. Pollock, who joined the Dilettanti only in 1870.[5]

Certainly there was no aristocratic patronage to be found among contributions to the Donation Fund for the promotion of scientific

(1) 7th Earl of Shaftesbury (1801-1885), philanthropist, D.N.B.; R.I. MSS., Laboratory Notebook, ii. (28 June 1842). This Notebook, which is not paginated, contains notes of work and analyses done by Faraday for other people, none of which appear in his 'Diary' recording his experimental researches (T. Martin (ed.), Faraday's Diary, 7 vols (1932-36)).

(2) 7th Duke of Devonshire (1808-1891), D.N.B. He was also briefly a Manager, see Appendix II.iii.

(3) The total number was thirty-six names, including two women, of whom seventeen had compounded, eleven of these before 1846 ('Membership List' (1870)).

(4) Society of Antiquaries 'List of Members', 1840 and 1870. It is only fair to add however that the Antiquaries too had lost some of their former lustre, and had also extended their membership greatly in rural areas (Evans, op.cit., pp.297, 299).

(5) Cust, op.cit., 'List of Members of the Society of Dilettanti, arranged in chronological order of election', pp.239-314.

research set up in 1863 by Bence Jones. During the Fund's ten years of existence, Members of the R.I. contributed £302.75, or a mere 13.7% of the total.(1) The only titled name among them was that of a foreigner, the Comte de Paris, Orleanist pretender to the French throne, who donated £50. The Comte with his brother, the Duc de Chartres, had joined the R.I. in the 1860s. But the Comte de Paris, who published a book on English trade unions in which he advocated profit sharing, was not so much an old style aristocratic patron, despite his enormous wealth, as a product of mid-nineteenth century concern with social questions and political rights.(2) At the R.I. he not infrequently came to lectures, and appears to have been most interested in physics, on one occasion taking the chair at one of Tyndall's Discourses.(3)

Beyond paying their membership dues, and the Comte de Paris' one donation, such titled patrons of learning did not apparently feel obliged to support science at the R.I. by any further financial subventions. There were, it is true, donations and legacies from time to time, from gentlemen whose testamentary vagueness is the best guide to their generality of purpose. Sir George Philips, Whig M.P. for Poole from 1837 to 1852, described his intention in terms of a new year's resolution: "As I wish to do something at the beginning of the new year that I may have satisfaction in thinking of ..."(4) Thomas Botfield, uncle of Beriah Botfield (the ironmaster and bibliographer), expressed his "wish and desire to forward the improvement of Science" by donating in his will the equivalent of life membership subscriptions to the Royal Society, the R.I., the Geological Society, the Society of Arts and the

(1) Donations were listed in the Visitors' Annual Report each year. The Fund is discussed in more detail, below, pp.164-5.
(2) M. Barriere, Les Princes d'Orleans (1933).

(3) J. Tyndall, 'On Combustion by Invisible Rays', 20th Jan 1865 (P.R.I., iv. (1862-66), 329). For other appearances by the Comte at the R.I., see W.F. Pollock, op.cit., ii.68, and Tyndall, Journal VIIIa, p.357 (19 Jan 1866).
(4) Man.Min., IX.431 (11 Jan 1847).

Horticultural Society, spanning both general and specialist societies in a broad embrace.(1) The only large donation in this period (£2000 in 1870) came, as is often the case, from an eccentric, an East End wholesale dealer in hardware goods, Alfred Davis, who was alleged to be totally deaf and unable to hear one word of any lecture.(2)

However, while patronage of learning in the aristocratic tradition of the Enlightenment was on the decline, and interest in the useful applications of science held less appeal than before, patronage of learning by a new and wider world of intellectual interests was markedly increasing. This was one facet of the rise of the intelligentsia, which became so important in public, academic and literary affairs in the 1850s and even more so in the 1860s. The identification of particular individuals reveals how the R.I. was one of the places where several strands of this emergent intelligentsia came together. Although it may not be significant in statistical terms, and in any event difficult to quantify in such a way, the strengthening of this element was the most significant development in the membership in the mid-nineteenth century. It must indeed have had an enlivening effect on both the atmosphere of the R.I.'s social occasions and its reputation.

This element was naturally not entirely new, for there had always been a number of literary men of the older tradition among the Institution's Members. On the 1840 Membership List there appeared men such as Isaac D'Israeli, father of the future Prime Minister and a noted figure in John Murray's literary circle; or William Ayrton, opera producer and

(1) Ibid., IX.289 (5 Feb 1844).
(2) William Spottiswoode called Alfred Davis a "toy-dealer" and alleged he was deaf during a Discourse 'On the Old and New Laboratories at the Royal Institution' (P.R.I., vii (1873-75), 9). Davis' obituary in the Journal of the Society of Arts, xviii (14 Jan 1870), 164, described him as a wholesaler of every sort of hardware goods, an active member of the Society of Arts, and a benefactor of the Jews' Free School. Spottiswoode may have exaggerated the report of eccentricity, as no mention of his deafness appears elsewhere.

literary critic; and Peter Mark Roget, the physician-savant whose Thesaurus continues today to be regularly reprinted.(1) Alongside such men in the same tradition were gentlemen of distinguished literary and scholastic achievements, such as Sir George Staunton, writer on China and adviser to the East India Company; Henry Fox Talbot, best remembered for his pioneer work in photography, but who also worked on the deciphering of cuneiform inscriptions;(2) or Henry Gally Knight, traveller, antiquary, and author of "poems now justly forgotten, as well as works which still have their value on the architecture and history of the Normans".(3) By the 1860s however both the kind of gentleman of letters and the Dilettanti-antiquary had changed, and not merely increased in number. One may select from among the more important John Ruskin himself, that controversial art historian and social theorist, who joined the R.I. in 1864.(4) Important figures in their time, but less widely known today, were men such as John Forster (joined 1853), historian and biographer; the elder Charles Wentworth Dilke (joined 1856), antiquary, critic and former editor of the Athenaeum; John Hogg (joined 1863), barrister, classical scholar and naturalist; Sir James Lacaita (joined 1866), diplomat and Italian scholar; Sir Edward Smirke (joined 1868), lawyer and antiquary, and brother of Sydney Smirke, the architect, who had also been a Member from 1836 to 1855.(5) Nor should one forget

(1) Isaac D'Israeli (1766-1848), William Ayrton (1777-1858), Peter Mark Roget (1779-1869), D.N.B. Roget became the first Fullerian Professor of Physiology at the R.I., 1834-37, on the nomination of John Fuller, eccentric R.I. benefactor ('The Charter, &c.', booklet, p.40; James Lawrie, 'John Fuller Esquire of Rose-Hill', P.R.I., 44 (1971), 331-57).
(2) Sir George Staunton (1781-1859), Henry Fox Talbot (1800-1877), D.N.B.
(3) Cust, op.cit., p.170. Staunton was also a member of the Dilettanti (ibid., p.290).
(4) John Ruskin (1819-1900), D.N.B.
(5) John Forster (1812-1876), C.W. Dilke (1789-1864), John Hogg (1800-1869), Sir James Lacaita (1813-1895), Sir Edward Smirke (1795-1875), Sydney Smirke (1798-1877), see D.N.B. on all these men. From 1855 the year each person joined the R.I. was printed against their name in the Membership List.

Connop Thirlwall, bishop of St. David's and historian, who joined the R.I. in 1850 and remained the only bishop to do so in this period.(1) There were also always one or two members from the classical department of the British Museum (an institution which at that time lacked any social cachet), men whose scholarly achievements were well recognised by colleagues in their field: William Vaux (joined 1851), author of works on Greek, Egyptian and Assyrian antiquities and history, and Charles Newton (joined 1867), archeologist and classicist.(2) Beneath these men, who if not the elite of the intellectual aristocracy, formed at least the second rank of the intelligentsia, there is some evidence that the R.I. was also favoured by the new and quite different type of professional literary man of the mid-century, the journalist, reviewer or miscellaneous author. From the 1850s onwards there were on occasion people who explicitly identified themselves as belonging to the "literary profession", for example Joseph Payne (joined 1866), a soldier of fortune in Spain during the Carlist wars, author of various works on Jersey, and later the editor of Haydn's Universal Index of Biography.(3) The literary achievements of others were so minor, that their own identification of their profession on their membership certificates is the only surviving evidence of it.(4) For instance, L.T. Cave pressed his claim as a suitable candidate by stating not only that he was "formerly Capt. 54th Regt.", but also the "author: The French in Africa", a volume published in 1859, a considerable time before he joined the R.I. in 1871.(5)

Another group among these men of letters should also be discussed

(1) Connop Thirlwall (1797-1875), D.N.B.
(2) William Vaux (1815-1885), Sir Charles Newton (1816-1894), D.N.B.
(3) Joseph Payne (1833-1898), Boase, vi.369; Gen.Min., VII.76 (5 Feb 1866).
(4) For example, the membership certificates identify Edward R. Drury as "literary" (ibid., VI.30 (5 Apr 1852), and J.R. Andrews as "Author of Four Months Tour in the East" (ibid., VI.148 (5 Feb 1855)). Neither appear in the comprehensive list compiled by S. Austin Allibone, A Critical Dictionary of English Literature and British and American Authors, 5 vols (1899), hereafter cited as Allibone.
(5) Gen.Min., VII.307 (5 June 1871).

here. Newspaper proprietors and publishers were often themselves writers, and publishers in particular had close personal friendships with their authors. In 1840 there were two publishers who belonged to the R.I., Edward Moxon, who specialised in poetry and wrote it himself, and John William Parker, printer and publisher to the University of Cambridge.(1) By 1870 the R.I. counted among its Members two of the most important publishers of scientific as well as non-scientific works, Alexander Macmillan and William Longman.(2) Macmillan supported Nature (first published 1869) through its early struggles and was well repaid when the journal under Lockyer's editorship rapidly became the most influential and widely read general scientific journal of the day.(3) His social circle included poets, artists, scientists, men of letters, and one result of their regular weekly gatherings was the publication in 1859 of Macmillans Magazine, one of the most successful of the new crop of literary periodicals. William Longman, related by marriage to William Spottiswoode, the Treasurer of the R.I. (whose family firm printed for Longman), wrote historical works, but was also an amateur entomologist and distinguished alpinist.(4) He appears to have filled the position, insofar as anyone did, of R.I. publisher, for besides Tyndall's works, Longman published Bence Jones' two historical works, the Life and Letters of Faraday (1870) and The Royal Institution: its Founders and its first Professors (1871), as well as Sir Henry Holland's memoirs, Recollections of Past Life (1872). Another publisher to be found at the R.I. was John Rivington, of an old-established firm of

(1) Edward Moxon (1801-1858), John William Parker (1792-1870), D.N.B.
(2) William Longman (1813-1877), D.N.B. On Alexander Macmillan, see C. Morgan, The House of Macmillan 1843-1943 (1943).
(3) Meadows, op.cit., pp.25-9.
(4) Longman's sister Mary (1801-1870) married Andrew Spottiswoode, uncle of William Spottiswoode. Longman also had family connections with another R.I. Member, John Dickinson (joined 1855), the paper manufacturer (Philip Wallis, At the Sign of the Ship: Notes of the House of Longman 1724-1924 (privately printed, 1974).

theological publishers (which included the S.P.C.K. among its customers), and mention should also be made of an interesting group of newspaper proprietors: John Walter, chief proprietor of The Times; J.E. Taylor, son of the founder of the Manchester Guardian and later its proprietor; G.A. Spottiswoode, brother to William, senior partner in the family printing business and owner of two shipping periodicals; Edward Cox, barrister and proprietor of several periodicals including The Law Times, The Field and The Queen.(1) Finally one should not omit the Anti-Corn Law Leaguer and journalist, A.W. Paulton, and that harbinger of a new style international journalism, P.J. Reuter.(2)

All the men mentioned above joined the R.I. in that important decade, the 1860s.(3) Leaving aside the closely interwoven family and business connections, had they any common motive? Generally they had a personal interest in some particular branch of learning, which might take them to one of the specialist societies, especially if it was one of the natural sciences, but which also drew them to the premier non-specialist learned society where even the most complex of scientific subjects was (usually) treated with simplicity as well as intelligence. Longman had a "taste for natural science", Paulton was "in later years keenly interested in the progress of physical enquiry", Walter had instituted experiments leading to the adoption of a new type of press for easier and faster printing.(4) One of Cox's periodicals, The Field, devoted much space to natural history, and many articles in this area were contributed by another R.I. Member, George Henry Kingsley, who was a well-known travelling doctor-companion and author.(5)

(1) John Rivington (d.1886), Boase, iii.189. For John Walter (1818-1894), J.E. Taylor (1830-1905) and Edward Cox (1809-1879), see D.N.B. G.A. Spottiswoode (1827-1899), Boase, vi.602.
(2) A.W. Paulton (1812-1876), D.N.B. P.J. Reuter (1816-1899), Chambers Biographical Dictionary (1974), p.1075.
(3) Except Longman who joined in 1858, and G.A. Spottiswoode in 1870.
(4) Cited in D.N.B. entry for each man.
(5) George Henry Kingsley (1827-1892), D.N.B. His many articles in The Field were signed under the pen-name of "The Doctor".

Scientific interest of a different sort came from what at first sight appears to be a more unexpected group, artists and sculptors, who joined the R.I. in small but increasing numbers. In 1840 only Thomas Phillips, the historical and portrait painter, and Sir Francis Chantrey, the portrait sculptor, were to be found on the list of Members.(1) Both men were then at the height of their careers, and considerable social figures in a wide literary-artistic-scientific circle. In the following years, and once again it was the later 1850s and the 1860s which were the important years, a gréater number of artists and sculptors joined than ever before. In part one may see this as one result of a professional interest in science, above all in chemistry, as the rediscovery of fresco techniques in the 1840s aroused interest in the apparently superior technical processes of the ancient masters. Furthermore, an exact knowledge of materials used, as well as a mastery of technique, was seen perhaps as a prerequisite for attaining that ideal of "truth to nature", which was so widely considered to be the sign of true art in the mid-century. Many artists in this period spent a considerable amount of time on such scientific details as the properties of colours, and science was called upon to serve as the handmaid of fine art. The importance accorded to science was exemplified at the end of the period under discussion here, when in 1871 the Royal Academy appointed a Professor of Chemistry, and it was A.H. Church, mentioned earlier as one of the few new scientific Members, who became its second Professor in 1879.(2) Here too one should note the connection of a far more important R.I. Member with the Royal Academy, for between 1860 and 1873 Sir Henry

(1) Thomas Phillips (1770-1845), Sir Francis Chantrey (1781-1841), D.N.B.
(2) Sir Walter Lamb, The Royal Academy: A Short History of its Foundation and Development (1951), p.96. The Professor of Chemistry appears to have given a course of lectures in October and November on Chemistry. Church subsequently published many books on the chemical aspects of painting, porcelain and pottery (Who Was Who 1897-1916, p.136).

Holland, while he was also President of the R.I., held the position of Foreign Corresponding Secretary of the Royal Academy.(1) This was an honorary position which appears to have involved no work at all, but nonetheless it serves to emphasize once more the continued absence of divisions between one field and another, and how far the R.I. was from being purely a scientific society in twentieth century terms. The R.I.'s Professors too were involved in this area: Faraday, that ever-willing chemical expert, had several years before in 1844 been consulted by Charles Eastlake, later knighted and the President of the Royal Academy from 1850 to 1865, on a theory to improve the quality of fresco colours.(2) Edward Frankland, Professor of Chemistry at the R.I. from 1863 to 1868, did a certain amount of work earlier on the chemical properties of various pigments, and included the subject in his 1857 afternoon Course of lectures, which was attended, he noted, by "several artists of eminence".(3) Science was useful therefore in the production of works of art, as well as its better known uses in the preservation of such works, where once more Faraday was consulted several times.(4) This scientific interest, together with the atmosphere of a cultured soiree - and the Friday evenings at the R.I. bore considerable resem-

(1) S.C. Hutchinson, History of the Royal Academy 1768-1968 (1968), Appendix D, p.238.
(2) Sir Charles Eastlake (1793-1865), was Secretary from 1841 to the Fine Arts Commission appointed to decide on the decoration of the new Houses of Parliament (D.N.B.). Fresco was the medium selected. For Faraday's experimental notes, see R.I. Laboratory Notebook, ii. (30 Aug 1844), and for his lengthy description of his investigations, Williams, Selected Correspondence, i.423-5.
(3) Sketches from the Life of Edward Frankland edited and concluded by his two daughters M.N.W. and S.J.C. (1902), p.130. Frankland's Course was entitled 'On the Relations of Chemistry to Graphic and Plastic Art', for which a syllabus may also be found in his memoirs (ibid., p.129).
(4) For Faraday's work in connection with marbles in the British Museum and pictures in the National Gallery, see Williams, Michael Faraday, pp.479-82. Furthermore, several years earlier Faraday was consulted about the corrosion of a bronze statue by "Mr. Hawkins B M", who was probably Edward Hawkins, Keeper of Antiquities at the British Museum from 1826 to 1860 (R.I. Laboratory Notebook, ii. (24 Mar 1845)).

blance to the Royal Academy occasional evening conversaziones - may explain the presence of several major figures: Edward Armitage, historical painter; Sir Edwin Landseer, the enormously popular animal painter; Matthew Noble and Matthew Wyatt, both successful and prolific sculptors.(1) There were also several minor figures; Robert Tait, the portrait and genre painter;(2) Jerry Barrett, whose best-known painting was the famous scene of Florence Nightingale at the entrance to Scutari Hospital;(3) John Leighton, the writer on art and book illustrator;(4) as well as others of whom little more is known beyond their own identification of themselves, such as W. Thomas "artist" (who might be one of several artists of that name), H. Cook "landscape painter", and Robert Morant "decorative artist".(5) There were too representatives from the related field of printing and engraving, for example Henry Bradbury, the writer on printing, and G.C. Leighton, printer and engraver.(6)

Furthermore, there was that medium where art and science were truly blended, namely photography. In the 1850s and 1860s photography was an interest which drew the most unlikely people together. Exhibitions held in the library on Friday Evenings frequently included photographs taken by Members, or exhibited by Members. In the early 1850s photographs of Paris appear to have been especially popular, and such were

(1) Edward Armitage (1871-1896), Sir Edwin Landseer (1802-1873), Matthew Noble (1818-1876), and Matthew Wyatt (1777-1862), D.N.B.
(2) Robert Tait (fl.1845-75). His best-known work was of the Carlyles in the drawing room of their house in Cheyne Row (C. Wood, Dictionary of Victorian Painters (1971), p.167).
(3) Jerry Barrett (1814-1906), see C.Wood, op.cit., p.8.
(4) John Leighton (1822-1912), see Allibone, Suppl.ii.992. Leighton gave a Discourse at the R.I. in 1863 on 'Japanese Art - Illustrated by Native Examples' (P.R.I., iv (1862-66), 99-108).
(5) Gen.Min., V.214 (6 Nov 1843), VI.558 (1 Feb 1864), VI.351 (6 Feb 1860).
(6) Henry Bradbury (1831-1860), D.N.B. G.C. Leighton, Gen.Min., VI.550 (7 Dec 1863).

exhibited by Barlow, by Sir Charles Fellows (another Manager), and by Dr. Alfred Taylor, Professor of Medical Jurisprudence at Guy's Hospital.(1) Photographers such as Hennemann and Malone, and John Mayall, who set up photographic businesses, were frequent exhibitors.(2) Mayall, an American who made a fortune in small cartes de visite photographs, later joined the R.I. in 1864, although by that time he described himself as an "artist".(3) The only man to join the R.I. at this time and describe himself as a "photographer" was Roger Fenton, who first trained as an artist and then devoted himself to photography, and, in making his celebrated record of the Crimean War earned the distinction of becoming the first war-photographer.(4)

Art's sister profession, architecture, also provided a constant number of Members. Architecture had links as close to art as to the engineering sciences, recognised by the incorporation of a school of architecture in the Royal Academy from its foundation. In 1840 important figures such as Sir Charles Barry, architect of the new Houses of Parliament, George Basevi and Decimus Burton all belonged to the R.I.(5) George Moore, an original member of the Royal Institution of British Architects, founded in 1834, was for many years a Manager of the R.I. There were minor figures too whose profession as architect is difficult to distinguish from the less illustrious one of surveyor,(6) but nevertheless there were still in the latter part of this period figures with the

(1) P.R.I., i (1851-54), 28, 97, 168. On Sir Charles Fellows, and Dr. Alfred Taylor, see D.N.B., and Appendix II.i and iii.
(2) Hennemann had a photographic business in Regent Street and between 1849 and 1853, Malone appears to have been in partnership with him, until appointed Director of the laboratory of the London Institution (London Post Office Directory, 1848-54). On Mayall, see P. Pollock, A Picture History of Photography (1963), p.53.
(3) Gen.Min., VII.24 (7 Nov 1864).
(4) Gen.Min., VI.265 (7 Dec 1857).
(5) Sir Charles Barry (1795-1860)m George Basevi (1794-1845), and Decimus Burton (1800-1881), D.N.B.
(6) For example, W. Booth, Surveyor to the Drapers' Company, or J.W. Griffith, surveyor and architect of schools (H.M. Colvin, A Biographical Dictionary of English Architects, 1660-1840 (1954), pp.85, 249). In the latter part of the century, some surveyors were extremely successful, such as H.A. Hunt (1810-1889), knighted in 1876, who had joined the R.I. in 1865 (Boase, i.1590).

eclectic interests of Philip Hardwicke, who joined the R.I. in 1859, and was a fellow of the Royal Society and the Society of Antiquaries, a member of R.I.B.A. and the Institution of Civil Engineers, and Treasurer of the Royal Academy from 1850 to 1861.(1)

From art and architecture one may return to literature by a different route. Literature was one of the few callings which could be followed by a woman. By the end of the 1860s, women formed for the first time a significant proportion of the membership. In 1840 only five women (0.6%) appeared in the Membership List, but by 1870 there were forty-eight (5.1%), and more than half of these had joined in the 1860s. These women may be divided into three main groups: relatives of the Managers, ladies with pretensions (genuine or otherwise) to culture, and women who were major figures in their own right. Among the first group were the wives of William Spottiswoode, John Hall Gladstone, William Pole (Treasurer of the R.I. from 1849 to 1865), Sir George Everest, Ceasar Hawkins (a colleague of Bence Jones at St. George's Hospital), one of J.P. Gassiot's daughters, and a daughter of Sir William Bowman, ophthalmic surgeon and a future secretary of the R.I. in the 1880s.(2) Not surprisingly, there were several members of the Pollock family: William Frederick's wife Juliet, whose reputation as an expert on French drama and contemporary European literature enabled her to break the masculine barrier in the literary reviews;(3) his mother Lady Pollock, widow of Sir Jonathan, the eminent lawyer; and his aunt, wife of Field-Marshal Sir George of Afghan fame. But women like these, who were prepared to resign the financial advantages available to wives of Members and their children under the age of twenty-one, who were entitled

(1) Philip Hardwicke (1792-1870), D.N.B.
(2) 'Membership List' (1870). See Appendix II.i for Everest, Hawkins and Bowman.
(3) The Wellesley Index lists twelve articles by Juliet Pollock in Frasers Magazine, Nineteenth Century, Contemporary Review, Macmillans Magazine, and the Quarterly Review (i.1051, ii.1044). See also Allibone, Suppl.ii.1242.

to reduced rates for lectures,(1) must surely have viewed their subscription primarily as a philanthropic object. It is arguable too that the membership of the wives of peers, such as the Duchess of Northumberland, was also patronage.(2)

More interesting are those women who did not form part of the family group of R.I. Managers. Some women joined the R.I. together with their husbands, but these were seldom people of particular note. Certain women married to notable men, joined the R.I. although their husbands did not, such as for example, the wife of Henry Huth, banker and bibliophile, and the wife of Alfred Morrison, art and autograph collector.(3) Sometimes such women asserted their suitability by reference to their husband, as one membership certificate stated, "wife of Jacob Waley, barrister, late professor of political economy, University College, London".(4) But other women Members deserve to be remembered on their own account, for example, Anna Letitia Le Breton, the authoress; Anna Swanwick, the translator of Greek and German drama and later a founder of Girton College; and Baroness Burdett-Coutts, the wealthy philanthropist and friend of Dickens.(5) Baroness Burdett-Coutts, who was incidentally never a benefactress of the R.I., certainly had the scientific interests of her time, and her geological collection was widely known.(6) However, such women as Anna Swanwick, who joined in 1858, are more representative of the women intellectuals who in the 1850s and 1860s were actively engaged in public matters, particularly those concerning

(1) Members' wives and their children under twenty-one paid only half the normal price for tickets to afternoon Courses of lectures, and many availed themselves of the privilege as the ticket books show (R.I. MSS, 'Subscribers to Lectures', i-iii. 1847-1875).
(2) Wife of the 4th Duke, President of the R.I.; she became a life Member in 1847.
(3) Henry Huth (1815-1878), Alfred Morrison (1821-1897), D.N.B.
(4) Gen.Min., VII.279 (5 Dec 1870).
(5) Anna Letitia le Breton (1808-1885), Anna Swanwick (1813-1899), and Baroness Angela Burdett-Coutts (1814-1906), D.N.B.
(6) The collection was overseen by another R.I. Member, James Tennant (1808-1881), mineralogist and friend of Faraday (D.N.B.).

women's education, but who also found intellectual entertainment and relaxation at the R.I.

Indeed, in the 1860s the intelligentsia can be found at the R.I. in all its variety, for the membership included Christian socialists, philosophic radicals, reformers of the Social Science Association variety, Chadwickian educationists, as well as writers, publishers, artists and architects, men of science, photographers and strong-minded women. F.D. Maurice, the most distinguished of the Christian Socialists, was a Member from 1852 to 1869.(1) C.B. Mansfield, the promising young chemist who was also deeply involved in the early Christian socialist movement, joined the R.I. in 1849, became a Visitor in 1850, and but for his visit to South America in 1853 and his early death in 1855, might well have been appointed a Manager.(2) Another Christian socialist, Nevil Story Maskelyne, the mineralogist, was a Member until his removal to Oxford in 1856 on being appointed Professor of Mineralogy.(3) Likewise Vernon Lushington, who became a distinguished judge but was involved in the early years of the Working Men's College, joined the R.I. in 1864.(4) Charles Kingsley himself was never a Member, although he lectured at the R.I., but his brother George, mentioned above, joined in 1858 as a life Member.

One can point to the related families of the Darwins, Wedgwoods and Galtons as representative of the later generation of philosophic radicals. Erasmus Darwin, the elder brother of Charles and well-known as a wit, had been a Member since 1830.(5) In 1855 he was joined by his nephew, Hensleigh Wedgwood, the philologist, and at the beginning

(1) F.D. Maurice (1805-1872), D.N.B. In 1866 Maurice became Professor of Moral Philosophy at Cambridge, which may account for his withdrawal from the R.I. three years later.
(2) C.B. Mansfield (1819-1855), D.N.B. Mansfield also gave a Discourse at the R.I. in 1849, and a Course of twenty-five lectures on 'The Chemistry of Metals' in 1852 ('Index to Lectures', (1842-1865), (1841-1912)).
(3) N.S. Maskelyne (1823-1911), D.N.B.
(4) Vernon Lushington (1832-1912), Who Was Who 1897-1916 (1920), p.442.
(5) For a portrait of Erasmus Darwin, see Henrietta Litchfield, Emma Darwin: a Century of Family Letters 1792-1896 (1915), ii.194-8.

of the 1870s by the younger scientific generation, two sons of Charles Darwin: George Howard Darwin, the future mathematician and astronomer, and Francis Darwin, the botanist, who was then a medical student; and their cousin, Francis Galton, pioneer of the science of eugenics.(1)

In the atmosphere of the fifties and sixties it would indeed be surprising were one not to find at the R.I. members of the Social Science Association, who were themselves drawn from a wide background. As mentioned previously, several of the R.I.'s Managers were involved in the Social Science Association, and more than a few R.I. Members too served on the Council of the Association, some of them in important capacities, as Presidents of the various departments for example. These included an active contingent of lawyers (Joseph Brown, Montagu Chambers, James Heywood M.P.), the interested aristocracy (the Earls of Derby, Ducie and Russell, and the sixth Duke of Northumberland, who became the President of the R.I. in 1873), and men such as William Newmarch, City actuary and statistician; Thomas Twining, of the tea-merchant's family and an authority on technical education; Sir James Kay-Shuttleworth, the former colleague of Chadwick who did so much to lay the foundations for teacher-training colleges.(2) Nor should one forget the younger Charles Wentworth Dilke, M.P. and an important organiser of the 1851 Great Exhibition, or philanthropists such as Charles Ratcliff or Edward Enfield.(3)

(1) Hensleigh Wedgwood (1803-1891), George Howard Darwin (1845-1912), Francis Darwin (1848-1925), Francis Galton (1822-1911), D.N.B. G.H. Darwin and Galton joined the R.I. in 1870, Francis Darwin in 1872.
(2) Joseph Brown (1809-1902), D.N.B.; Montagu Chambers (1799-1885), Boase, i.587; James Heywood (1810-1897), ibid., iv.649. 15th Earl of Derby (1829-1893) and 1st Earl Russell (1792-1878), D.N.B.; 3rd Earl of Ducie (1827-1921), Burke's Peerage & Baronetage; 6th Duke of Northumberland (1810-1899), Who Was Who 1897-1916, pp.530-1; William Newmarch (1820-1882), Thomas Twining (1806-1895), and Sir James Kay-Shuttleworth (1804-1877), D.N.B.
(3) Sir C.W. Dilke, 1st Bt. (1810-1869), and Edward Enfield (1811-1880), D.N.B.; Charles Ratcliff (1822-1885), Boase, iii.44-5.

What brought such a varied collection of people to the R.I.? In part, the secret of the R.I.'s attraction lay in its success in providing the kind of knowledge and the type of entertainment which appealed to the interests and tastes of the people just described. It should be remembered too that the 1860s were a decade of intense interest in all matters scientific when the public followed every detail of controversy, and moreover, it was a time when confidence in the ability of science to provide solutions to practical problems had not yet evaporated. The Courses of Lectures, the Discourses, the Library and the objects on exhibition all played a part in this. This subject however will be more fully explored in chapters four and five; it is another and quite different explanation which needs to be considered at this point, namely, the attractiveness of the R.I. as a social ladder. In itself, the growing number of Members from humbler backgrounds and occupations suggest that this was a potent attraction. The need to manifest the right kind of social status was keenly felt in a society as acutely status-conscious as mid-nineteenth century England.(1) Membership of the right type of learned society could be one indication of the satisfactory nature of one's interests and general culture. The R.I., with its upper-class image and scientific reputation, was an ideal venue for the socially aspiring, and helps to explain the apparently contradictory fact that while the intellectual element in the membership was strengthened, the social composition of the membership showed evidence of more varied and humble origins. The Institution was not cheap, and therefore excluded those not endowed with respectably ample means. The annual subscription was 5 gns., with an admission fee of a further 5 gns.,

(1) It was only for what might be termed offences concerning status, and the proper conduct of a gentleman, that Members were ever ejected from the Institution, as opposed to being quietly dropped from the Membership List. Such offences included committing a felony, being sentenced to transportation, or brawling on the premises; examples may be found in Man.Min., IX.250 (20 Mar 1843), 263 (5 June 1843), XI.171 (2 Feb 1857).

which was raised in 1868 to 10 gns.[1] A comparison with other learned societies of the day shows the R.I. to have been the most expensive, with the Society of Antiquaries and the Royal Society approaching it the closest. The two latter had (until 1868) higher admission fees, 8 gns. and £10 respectively, but their annual subscriptions were lower at 4 gns. and £4.[2] The normal London learned society subscription was 2 gns.[3] As already mentioned, composition was common in the earlier part of the period under discussion, and the names of those who had compounded were marked with a symbol in the Membership List. Those who had paid a further 20 gns. for transferable rights of admission, or for the admission of a nominee to the lectures, had further asterisks against their names as a proof of their ample purses and proper intentions. Withdrawal from membership on account of the cost was not uncommon, and quite a number of Members evidently found themselves pressed for 5 gns., as the subscription ledgers contain such entries as "Robert Allison: promised to pay 50 times, but never performed. Bankrupt"; "Benjamin Clark: Run away. Bankrupt"; "Rev. T.G.A. Rushton: Run away about August 1854"; or even "Col. Jas McDouall: Will not pay".[4]

What opportunities did the R.I. provide for those determined to climb the social ladder? A Member had the right to put M.R.I. after his name, and it was increasingly common for people to add initials after their names, just as it became usual for any professional man to proclaim

(1) Man.Min., XII.229 (3 Feb 1868).
(2) Hume, op.cit., pp.70, 75. The Antiquaries however halved their subscription in 1853 in order to attract new members (Evans, op.cit., p.271).
(3) Annual subscriptions for the Royal Society of Literature, the Society of Arts, the Statistical, Astronomical, Geographical, Chemical, Ethnological and Botanic Societies were all £2 or 2 gns. Some were even cheaper, for example, the Microscopical, Entomological and Philological asked only 1 gn. a year for membership (Hume, op.cit., passim).
(4) R.I. MSS, 'Members Subscriptions', ii. (1851-55), pp.1, 8, 44, 33. These ledgers containing details of subscriptions are labelled 'List of Members', but will be hereafter referred to as 'Members Subscriptions' in order to avoid confusion with the 'Membership Lists'.

his membership of the appropriate professional body.(1) Moreover, it was normal by 1840 for societies to publish lists of their members and there was good company to be found on the R.I. list. In addition to Membership Lists, from 1850 the R.I. published lists of "PRESENTS received" in the Visitors' Annual Report, and from 1851 in the Proceedings also.(2) These "PRESENTS" consisted chiefly of books to the Library, and it was no doubt useful as well as pleasing to the struggling medical man, for instance, to have his treatise or report listed alongside works by Faraday, Tyndall, de la Rue, Sabine, Wheatstone and the journals of all the leading scientific societies of the day.(3)

With regard to the newer humbler professions, it is impossible to distinguish between social and professional climbing, for in these decades it was uniquely the case that the two could not be separated because of the ambiguous status of the new professions. It is likely that the attachment of that forceful and energetic pharmaceutical chemist, Jacob Bell, to the R.I. in the 1830s and early 1840s was at least in part the product of his desire to better the position of the more respectable chemists and druggists incorporated under his leadership in 1841 into the Pharmaceutical Society. An active Member, he regularly presented the R.I. with the Pharmaceutical Journal, and presented shortly before his death in 1859 the folios already published by John Gould, the ornith-

(1) R.I. Bye-Laws , xi. art.19. See the contemporary Post Office Directories for the widespread use of initials. Later in the century this became a matter of concern to many learned societies, and as early as 1853, the Rev. A. Hume felt it necessary to include a section on the mistaken use of initials (op.cit., pp.8-11).

(2) In 1848 a list of presents received was printed separately, apparently for the first time, but from 1850 this list was included in the booklet containing the 'Annual Report' and 'Statement of accounts' (R.I. MSS, Guard Book, ii.item 90).

(3) Naturally not all the authors were Members of the R.I., but it is noticeable that they included a fair number from the medical profession, and the R.I. appears to have been definitely on the circulation list for medical authors.

ologist, with their exquisite illustrations of birds.(1) A valuable, beautiful and learned series, it made a pleasing remembrance of the worthy pharmacist among the works of the most distinguished scientists and scholars of the day.

The medical profession supplies more evidence of the possible social uses of scientific societies, and indeed it could well be argued that one of the best ways for a doctor to advance his career in the nineteenth century was to join as many learned societies as possible. A scientific interest could be professionally useful to those who had to acquire their clientele in the "right" social circle. This must have operated even more strongly in the provinces, where active membership of the local scientific society, or a well-known collection of, for example, geological specimens, would surely help to provide an entree to cultivated society. In London, society was more open but the competition was fiercer. The R.I. had the highest social reputation of all the possible scientific societies that a doctor might join. It is clear too that the largest and most constant number of new Members from the professions were doctors or surgeons. In the 1850s the number of new Members from the medical profession rose sharply, and remained at the same high level in the 1860s. However, it was the medical profession that figured the most prominently among those who withdrew from the Institution. In the five years from 1845 to 1850, when records first become available, only four doctors withdrew. The rate remained the same during the decade 1850 to 1860, but doubled in the following decade (see Table 4). One can only surmise what were the reasons for this increase. Some were clearly unable to afford the annual subscription, as Hugh Welch Diamond, M.D. confessed his "utter inability to

(1) Jacob Bell (1810-1859), and John Gould (1804-1881), D.N.B. See P.R.I., iii (1858-62), 154 for Bell's letter accompanying the gift. The R.I. continued to buy the remaining folios as they were published.

Table 4[1]

The Medical Profession	1840-49	1850-59	1860-69
New Members	41	53	55
Withdrawals	4 (1845-50)	9	20

pay" and several years' arrears were not unusual.[2] Some may no longer have found the R.I. congenial to their tastes, in an atmosphere of increasing professionalization in their own sphere. Nonetheless, it is also reasonable to interpret the increase in the number of medical men joining only for a short period as an essay in social-cum-professional advancement, which was abandoned either because it had achieved its purpose, or because it did not succeed. At least it is clear that a number of related factors may be seen at work here, and that concern with status was a matter of continuing importance. Nor was it neglected by the management, and it may well have reflected some concern with status as well as with mere numbers for the Managers in 1860 to adopt the practice of reading out at their Meetings the certificates of the candidates for membership.[3] There is some evidence too that suggests that the R.I. was perhaps the only non-specialised society that managed to increase its membership in the 1860s, in a period when there was another bout of activity resulting in the foundation of new specialist

(1) Source: new Members' certificates entered in Gen.Min., VI-VII, and 'Members Subscriptions', 3 vols., 1845-70.
(2) 'Members Subscriptions', iii. (1861-65), p.20. Diamond (1809-1886) appears to have been especially interested in photography, and in persuading the Society of Antiquaries of its uses. He was appointed "Honorary photographer" to the Society (Evans, op.cit., pp.290-1). He also kept a private asylum for female patients, and left a collection of china worth nearly £3000 when he died, so his may have been as much a case of changing tastes as of poverty (Boase, i.868; Annual Register (1887), pt.ii.91).
(3) Man.Min., XI.314 (6 Feb 1860). Mention in the Minutes of the certificates of candidates re-occurs from time to time, for example, XII.350, 416 (5 Nov 1860 and 3 Mar 1862).

societies and institutions in both scientific and literary fields.[1] In contrast to, for example, the London Institution and the Society of Antiquaries, the R.I. continued to increase its membership until around 1880, when it levelled off and remained static for the rest of the century.[2] The attractions of the Institution as a social ladder may well provide one reason for that success.

An institution is *de facto* an active, living corporation. In its simplest form, the management is the directing force of that corporation, and the members its limbs. There is a two-way relationship between the parts. The management directs and is responsible for the purposes of the Institution, and the members, in return for their financial brawn, receive certain rights and privileges. The formal rights and privileges of the Members, the relationship of the membership to the management, and the ways in which the Members were involved in the organisation of the Institution's affairs, all throw light on what sort of Institution the R.I. really was and why it developed as it did.

On paper the rights and privileges of the Members remained unchanged throughout this period. These rights included admission to all the public parts of the Institution, "the Repositories, Libraries, Reading-Rooms, Collections, and Laboratories",[3] and also the right to send

(1) Steeves describes the increase in literary society activity and the numerous new foundations following the success of the Early English Text Society in 1864 (*op.cit.*, pp.156-203). Other societies founded in the 1860s include the Anthropological Society (1863), the Royal Aeronautical Society (1866), the Royal Historical Society (1868). One should not forget the new professional organisations, such as the Institution of Naval Architects (1860), or the Institution of Gas Engineers (1863), for these institutions also had a social side to their activities, which imposed demands on their members' leisure, just as did the meetings of learned societies proper.
(2) The London Institution always had a problem disposing of vacant proprietorships (information received from Miss Cutler) and in 1867 the membership of the Society of Antiquaries was also decreasing (Evans, *op.cit.*, p.299). For information on the R.I.'s membership later in the century see Notebook (A), p.29 (R.I. MSS, Box 47, "Papers on Financial and Membership Trends 1877-1923").
(3) R.I. Bye-Laws , ii. art.20.

mineral or chemical specimens for analysis, a privilege that some Members continued to avail themselves of until the 1850s, as Faraday's "Laboratory Notebook" reveals.(1) From the later 1850s however this privilege was clearly obsolete, and one more impediment to the persecution of disinterested research was removed.(2) The work carried on in the laboratory had therefore nothing to do with the Members' personal concerns, and their direct involvement in science was limited to the right of free attendance at all lectures, the privilege of introducing two guests to the Friday Evening Discourses, and of obtaining tickets for afternoon Courses of lectures for their wives and children at half the normal price.

Ostensibly the Members' most important duty was to elect the Officers, Managers and Visitors of the Institution at the Annual Meeting in May each year.(3) This was however purely a formality, although the procedure does suggest a measure of accountability to the body of Members at large. The Professors too were unanimously re-elected every year by the Members, so that their appointments were technically not permanent, but renewable annually.(4) The semblance of an official connection between the appointment of the Professors and the management and the wishes of the Members was carefully maintained, but the men who really held all appointments in their hands were naturally the Managers. How representative were they of the Members? A comparison between the two reveals some striking contrasts, the most important being in the scientific element. The scientific element in the membership increased by only 1.3% over the period 1840 to 1870. However, the scientific element, taken as a percentage of the total man-management years in each of the

(1) Ibid., ii. art.21, and R.I. Laboratory Notebook , ii. Throughout the 1840s, requests for analyses of water samples formed the bulk of the entries.
(2) The Laboratory Notebook contains very few entries after 1852, and the last entry in Faraday's hand is dated September 1858.
(3) R.I. Bye-Laws , iv. art.1.
(4) Ibid., xiv. art.2.

three decades up to 1870, jumped by 31.3% (see Table 5):

Table 5

	Membership 1840–1870 %	Man-management years 1840/49–1860/69 %
Scientific element	+ 1.3	+ 31.3
The Law	+ 1.1	− 9.9
Medicine	+ 2.2	+ 0.6

This increase was at the expense above all of the law, although the law continued to maintain its position in the membership. Furthermore, it is most noticeable that while the intelligentsia joined the R.I. in increasing numbers from the 1850s, they rarely became Managers, unless they were themselves men of science, many of whom were part of the intelligentsia. As pointed out in the previous chapter, the number of Managers from the non-scientific element was extremely small, its principal representative being W.F. Pollock, himself a lawyer. The difference between the management and membership became thus more distinct as time progressed, and the management grew proportionately less representative of the membership as a whole.

One might therefore expect to find an increasing lack of communication between management and Members. In practice certain changes may be discerned, but the lines of communication and the formal relationship between the two were sedulously maintained. The framework for communication with the Managers and for the Members' participation in the affairs of the Institution was provided by the regular General Monthly Meeting, which took place once a month from November to July. These meetings, invariably chaired by a Manager, alone had the power to make, amend or repeal the Bye-Laws of the Institution, and to elect new Members.[1] In practice their chief business was to deal with Members' affairs - new elections, withdrawals, suspended subscriptions due to absence abroad, and the "admission" of new Members present at the meeting for the first time.[2] In addition, thanks were rendered for presents received by the Institution, and the speakers at Discourses congratulated on their efforts. On several occasions too Members suggested making changes, on such matters as the timing of lectures, to which the Managers agreed. When however Sir James South, the astronomer and friend of Faraday, called attention to the manner ~~with~~ in which certain unnamed lecturers on Friday Evenings in 1841 dealt with their subject, alleging that scientific truth was "sacrificed to friendly feeling for particular artists whose matters they may have been permitted to lecture on", the Managers neatly avoided such an awkward question by disclaiming all responsibility "for the correctness of the scientific communications in the Lecture-room on those Evenings".[3]

In the 1840s at least, these meetings provided an opportunity for Members to feel a formal sense of participation in running the affairs of the Institution, as opposed to participation only in a social or passive sense, for example by attending a Discourse. Faraday, with his talentfor the personal touch, was frequently present at the meetings in the 1840s and 1850s. On occasion he reported one of his discoveries, as for instance in 1845 when his researches on the action of magnetism on light first bore fruit, and impatient to announce his success he

(1) "Act for enlarging the Powers granted by His Majesty to the Royal Institution of Great Britain, and for extending and more effectually promoting the Objects thereof", 50 Geo.III. Cap.LI (18 Apr 1810)(reprinted in 'The Charter &c.' booklet, pp.18-20).
(2) From 1851 brief notices of these meetings may be found in the P.R.I.
(3) Gen.Min., V.130-1 (7 June 1841). Note too the use of the word "artist" in this context to mean scientific investigator.

told the next General Monthly Meeting of his discoveries.[1] Faraday, however low an opinion he had of the Members' scientific knowledge, always treated them as integral participants in the Institution, in a way that emphasized the two-way relationship. Tyndall on the other hand had no such delicate perceptions, and in any case lacked Faraday's consummate tact. There is no record that he attended the General Monthly Meetings, although he must have been present on occasion, but he treated the Members solely as an audience, who being on the receiving end, could do no more than give their applause in return. While he was able to delight and stimulate such an audience in the R.I. theatre, his attitude must have limited their sense of participation in the more important work of the Institution. In any event, in the 1860s some increase in the distance between the Members and the management was no doubt inevitable, as the administrative structure of the Institution was organised into a coherent unified form, and routine took over here, as relentlessly as it did in so many other organisations at this time. By 1870, the rubber-stamping of changes in the Bye-Laws proposed by the Managers apart, the sole purpose of the General Monthly Meetings was to put a formal seal on anything concerning Members' subscriptions, and to express a proper appreciation for the instructive entertainment provided for them. Emptied of significant content vis-a-vis the important objectives of the Institution, yet still the traditional forms of Members' participation remained for the next one hundred years.

(1) Man.Min., IX.357 (3 Nov 1845); Gen.Min., V.288 (3 Nov 1845). In December Faraday asked the Managers if he could report further results (Man.Min., IX.365 (1 Dec 1845)), to which they agreed, but no mention of any report appears in the General Monthly Meeting Minutes of that date. For another occasion when Faraday reported on research, this time by Schoenbein, see <u>P.R.I.</u>, i (1851-54), 400.

Chapter 3

The Laboratory - Scientific Research or Instruction?

If the membership ceased to be directly involved in the important work of the Institution, and if the management became progressively less representative of the people on whom the Institution relied for financial support, what were the consequences for the objectives of the R.I.? Until the management decided which was the most important of the R.I.'s several objectives, there was indeed more than a little confusion. Part of that confusion concerned the type of science, "exact science" or "useful knowledge", that the R.I. should be most concerned with, and part concerned the obvious discrepancy between the objectives of the R.I. as laid down in its Charter and the actual activities which took place within its walls. For scientific research was not included in the original statement of objectives as outlined in the Charter or in the 1810 Act of Parliament. Indeed it would have been rather surprising if it had. Yet clearly in retrospect the Institution's greatest significance lay in the outstanding research done in its laboratories, in particular that by Faraday. Since original research had early become an important factor in its activities, and under Humphrey Davy had contributed in no small measure to gaining the public reputation (fashionable though that might be) which remained with the Institution for the rest of the nineteenth century, one would expect that by the 1840s scientific research would be recognised by the management as a primary objective. Because too Faraday's research achievements stand four-square within the great historic tradition of individual scientific discovery, it is not surprising that the Institution where he pursued his research should be seen by later historians as one which accepted the pursuit of scientific truth and discovery as an end worthy for itself alone. All the evidence however suggests that this was not so. This chapter will be concerned with the story of how research came belatedly and tardily to be officially recognised as the most important objective of the Institution, to which all other activities should at least in theory be subordinated. By the beginning of the 1870s research was indeed recognised as the Institution's primary function, but nonetheless the R.I.'s other activities still survived and indeed flourished as never before. A state of co-existence had emerged as a satisfactory compromise, at least for a time. There had however been a fundamental alteration in the balance of importance between the several objectives. In the mid-century a series of specific turning points may be identified which determined this new balance.

The chief rival to scientific research at the R.I. was education, although demands for professional expertise and scientific consultancy also played some part. In the 1820s the income from the thousands of analyses done in the laboratory had helped the R.I. to survive a period of chronic financial instability.(1) From the early 1830s Faraday rejected any continuation of this kind of operation on a large scale, but nevertheless, while Faraday lived, the Institution's laboratory does appear to have been available for the type of analysis that today no leading experimental scientist would ever be asked to undertake. This type of request was a reflection of the utilitarian conviction that social problems could be overcome with technological or scientific help, which no doubt accounts for the considerable number of water analyses that Faraday continued to carry out throughout the 1840s.(2) Some of these analyses were for Government officials, such as the "Bottle of water from Major Jebb R.E. from well in chalk at the model prison,

(1) Williams, Michael Faraday, pp.302, 359 n.8.
(2) R.I. Laboratory Notebook, ii. (1830-1865). Water analyses account for the majority of the entries.

Copenhagen fields",[1] but equally some were for R.I. Members, and for members of the public of whom nothing more is known. By this time no payment appears to have been made for such services. By the end of the 1840s however, the number of analyses made personally by Faraday had greatly diminished, and furthermore, they became concerned less with problems of applied science, than with such speculative archaeological problems as the investigation of three lots of earth from a mound in Jerusalem to see if they contained ancient ashes.[2]

A more potent threat to the undisturbed pursuit of scientific research was always the Institution's educational activities. These were of two main types: the first was that indistinctly defined "diffusion of useful knowledge", the preoccupation of utilitarian reformers, which was provided by the R.I. chiefly in the form of Courses of lectures and the Friday Evening Discourses, which will be more fully discussed in the following chapter. The second kind was the more important in the present context, namely formal scientific education at a more advanced level, as exemplified in Brande's "School of Chemistry" for medical students.[3] The School of Chemistry at the R.I. was the result of Brande's close connections with the medical world. Brande had been Professor of Chemistry and Materia Medica to the Society of Apothecaries for as long as he had been at the R.I. (1813). Moreover from 1815, the Society of Apothecaries acted as the examining body for that section of the medical profession until the reorganisation of the 1850s, and Brande, as one of the official examiners and Professor of the Society, had thus a very personal concern with medical education.[4] By the end of the

(1) Ibid., ii. (29 Sept 1842). Sir Joshua Jebb (1793-1863), surveyor-general of convict prisons and a noted model prison designer (D.N.B.).
(2) R.I. Laboratory Notebook, ii. (11-12 Oct 1855). Faraday did not think the earth contained ancient ashes.
(3) See below, pp.137-41 for a fuller discussion of the School of Chemistry.
(4) Mathews, History of Pharmacy, p.247. Brande for example examined Keats in 1816, before the poet abandoned a medical career.

1820s the R.I. had achieved under Brande's direction a reputation in medical circles as a school of chemistry, at a time when a proper medical education was only beginning to be regarded as a professional sine qua non.[1] In addition, until the 1840s a medical education was often the only way to obtain a general scientific education, so it is no surprise to find in the early Victorian period that the links between medicine and science were still very close as far as education was concerned. However, new developments were slowly beginning to have an effect, as other institutions, in particular University College and King's College, London, began to provide opportunities for both a medical and a more advanced scientific education. The big London teaching hospitals too began to provide their own medical teaching schools, instead of relying on a number of private schools and institutions such as the R.I. to provide all preliminary instruction in medical subjects.[2] With its established reputation as a school of chemistry the R.I. might very well have been drawn more closely into this developing network of educational institutions, and an incident in 1843 shows how nearly this happened.

In November 1843 the R.I. was approached through Brande with a proposal to establish a school of practical chemistry at the R.I.[3] Had this school been established at the R.I., it would have turned the focus of the Institution's activities towards professional education, while experimental research would in all probability have been relegated to a very minor role. Practical chemistry may seem at first sight an

(1) Berman, 'Introduction', Man.Min., VI.
(2) Charing Cross Hospital founded their medical school in 1834; the Middlesex Hospital in 1836. In contrast, King's College and University College had medical schools, but were forced to reply on other hospitals for their students to gain the necessary practical experience. This prompted them to found their own hospitals, University College Hospital in 1834, King's College Hospital in 1840. As one historian has noted, this helped among other things to free them "from the fetters of the Society of Apothecaries" (Hearnshaw, op.cit., p.117).
(3) Man.Min., IX 274 (6 Nov 1843).

unlikely basis for such a school, but in the 1840s one should remember that chemistry was seen as the catalyst of change. Public interest in the subject was aroused by its applications in two fields. From 1838 onwards agitation for the repeal of the Corn Laws focused attention on the need to improve the country's agriculture,[1] an aspect which was highlighted by the work of that often-mentioned German chemist, Justus Liebig, on organic and agricultural chemistry. Peelite agricultural improvement and practical chemistry for a short time went hand in hand, as advocates of high farming and increased cereal production seized eagerly on Liebig's works, the first of which was available in translation in England from 1840.[2] At the same time, chemistry had an obvious contribution to make to the quite different field of health, both private and public, by contributing to the exact diagnosis and treatment of illness and disease, as well as its application in preventive measures of public hygiene, such as the provision of adequate and unpolluted water supplies. The medical profession naturally took a lead in using chemistry to attack problems which by the 1840s had reached intolerable levels.

Moreover, the humbler branches of the medical profession, the apothecaries and the unincorporated "chemists and druggists", ever alert to opportunities for advancement, were well aware of the uses of chemistry as a powerful lever for gaining professional status. Beneath the well-established physicians and surgeons, the lower branches of the medical profession lacked organisation. There were the apothecaries,

(1) For example, it was in 1843 that the Rothamsted Agricultural Experiment Station was started by J.B. Lawes (D.N.B.), who founded the artificial manure industry by treating phosphates with sulphuric acid.

(2) J. Liebig (ed. L. Playfair), Organic Chemistry in its Applications to Agriculture and Physiology (1840, 2nd ed. 1842). Lyon Playfair (1818-1898), chemist and scientific administrator, dated the peak of the wave of popular enthusiasm for practical chemistry to 1842-43 (L. Playfair, 'Personal Reminiscences of Hofmann and of the Conditions which led to the establishment of the Royal College of Chemistry and his appointment as its Professor', Journal of the Chemical Society, lxix (1896), 577.

with their powerful and ancient Society, who were permitted to manufacture and supply drugs as well as diagnose and prescribe treatment. Lower down the scale there was much confusion between operative or pharmaceutical chemists, who manufactured and sold chemical drugs and sometimes performed chemical analyses, and chemists and druggists, who generally sold crude drugs, either retail or wholesale. Naturally the standards of preparation varied enormously, as did the scale of operations, both of which served to distinguish the respectable quasi-professional man from the humble tradesman. To achieve the coveted professional status, these humbler branches of the medical profession needed to set exact standards of professional expertise, as much to keep out unauthorised practitioners as to advance the knowledge and practice of their own calling. Professional education, which included in this case a large amount of general scientific education, was consequently one of their major preoccupations. The next step was to provide facilities for educating candidates to the required standard, as shown for example by the establishment in 1842 of the School of Pharmacy, a year after the Pharmaceutical Society had been incorporated. However, such schools could not satisfy the need for courses in practical chemistry at this time, in 1843;(1) and it is not surprising to find that the proposal for a new school of practical chemistry at the R.I. should originate from these inferior branches of the medical profession.

The proposal was made by two men, Dr. John Gardner and J. Lloyd Bullock. Gardner had qualified as an apothecary in 1829, and later

(1) The laboratory of the School of Pharmacy did not open until October 1844, two years after the School's foundation, and then had places for only ten students (M.P. Earles, 'Pharmacy and its Relation of Scientific Education in Nineteenth-Century Britain', Pharmacy in History (U.S.A.), ii (1969, 47). University College, London, also had a laboratory for instruction in practical chemistry, but it was not until 1845 that a professorship of Analytical and Practical Chemistry was founded, and the Birkbeck Laboratory founded (Bellot, op.cit., pp.283-4).

spent some months in 1839 at Liebig's laboratory in Giessen where he met his future associate, Bullock.[1] On his return to England, Gardner worked as a translator of German material for The Lancet, the principal journal of the medical profession, which was among the earliest to publicise the Giessen system in England.[2] In 1843 Gardner translated and edited Liebig's Familiar Letters on Chemistry and its Relations to Commerce, Physiology, and Agriculture, and also dabbled in theology, publishing in the same year The Great Physician, the Connexion of Diseases and Remedies with the Truths of Revelation, which apart from the last chapter was entirely theological.[3] His colleague, Bullock, on his return to London became the head of a business of pharmaceutical chemists in Conduit Street, a couple of streets away from the R.I. He too was a publicist for Liebig's work to the pharmaceutical section of the medical profession, and an advocate of Giessen methods of training.[4] Brande, through whom they made the approach, was enthusiastic.[5]

The school proposed by Bullock and Gardner was to have two parts: a purely scientific school housed at the R.I., which was apparently intended to train research chemists with the pious hope expressed that

(1) Dr. John Gardner (1804-1880), rather surprisingly appears in the D.N.B., which his achievements hardly merit. For more detailed information on his career, and also that of Bullock, I am grateful to Mrs. G.K. Roberts, who dealt extensively with their activities in her work, The Royal College of Chemistry (1845-1853): A social History of Chemistry in Early Victorian England (unpublished Ph.D. thesis, John Hopkins University, 1973; a copy of this thesis may be found at Imperial College, London).

(2) Roberts, op.cit., pp.139-41.

(3) D.N.B. Gardner intended to publish a second volume concentrating on medical questions, but he never did so, perhaps discouraged by the unenthusiastic reception of the first.

(4) Roberts, op.cit., pp.141-2. Bullock translated two works on qualitative and quantitative analysis by Fresenius, a former pupil of Liebig and advocate of his methods.

(5) Brande first mentioned the subject in a letter to Barlow of 31 Oct 1843 (R.I. MSS, Box IXA. 121C). A second letter to Barlow, undated but written sometime between 6th and 24th Nov 1843, is enthusiastic in tone, saying that Brande was glad to find Faraday took the same view, as he hoped Barlow would (Box IXA. 121C).

many would devote their lives to research; and a separate laboratory elsewhere to undertake analyses on a commercial basis, and to provide the type of manipulative training necessary for an apothecary or a chemist-druggist.(1) The scientific school was not to be a part of the R.I., although the proposers admitted amalgamation would be desirable if the R.I. so wished.(2) The objectives of the scientific school were presented in terms well adapted to secure the support of the sort of people the proposers believed formed the majority of R.I. Members. As Brande and Faraday reported:

> The students, it is believed, will consist of gentlemen being lovers of the science for its own sake; landed proprietors, agriculturists or the sons of such, as also of the many others who are connected with or attached to the chemical arts and manufactures of the country. (3)

The practical laboratory on the other hand would deal with the "application of Chemistry to Medicine, Arts and Agriculture",(4) and "if deemed expedient", would also include:

> the course of manipulation required by the Apothecaries' Company; the analysis of soils or commercial articles for subscribers; the preparation of all the articles in the Pharmacopoeia in a consecutive course; and afterwards the application of Chemistry to the Arts, as Dyeing, etc." (5)

The emphasis was clearly on vocational training for the humbler branches of the medical profession, which accorded ill with the propers' professed desire to contribute to the progress of research:

(1) R.I. MSS, 'For a Practical Chemical School', n.d., 6 pp (Box IXA. 121C). This document is unsigned but there can be little doubt that it was written by Gardner and Bullock, sometime in mid-November 1843, as references in letters from Prudhoe to Barlow show (Prudhoe to Barlow, 27 and 30 Nov 1843, Box IXA. 121C).
(2) W.T. Brande and M. Faraday, 'Report on the proposed School of Practical Chemistry' (privately printed, 19 Dec 1843), p.2 (Box IXA. 121C).
(3) <u>Ibid</u>., p.1.
(4) 'For a Practical Chemical School', p.4.
(5) <u>Ibid</u>., p.4.

> Our views not being confined to a school simply i.e. an Institution for teaching the practice of analysis, qualitative or quantitative, but for taking a part in the investigations now in progress in Analytical Chemistry. (1)

In the patriotic atmosphere of the early 1840s, when chemistry was widely felt to be a universal panacea, and moreover when Liebig's reputation in England was never more acclaimed,[2] it is not surprising that the R.I. displayed unusual receptiveness to the proposals. The R.I.'s new President, Lord Prudhoe, agreed that "There is no doubt that a School of Practical Chemistry must soon be established in London; and ... the Royal Instn. appears the most suitable place for such a school".[3] The Managers asked Brande and Faraday to report, and this they did in extremely favourable terms, although they admitted there were some practical problems.[4] According to their 'Report on the proposed School of Practical Chemistry', the purpose was to create "a new class of chemists not so remarkable for their number, as for their thorough knowledge of the Science and its practice".[5] The aim was to be entirely educational, and it was emphatically stated that no analyses or investigations for other people were to bemade in the school, and that its professors and teachers were not to engage in any professional activity whatsoever.[6] The prohibition was however somewhat undermined by allowing analyses to be made "for (the school's) Members, for

(1) Ibid., p.1.
(2) In 1842 Liebig made a triumphal tour of England, visiting the establishments of all the chief agriculturists, as well as many of the larger towns, with Lyon Playfair acting as guide (Playfair, loc.cit., p.577).
(3) Prudhoe to Barlow, 9 Nov 1843 (Box IXA. 121C).
(4) Man.Min., IX.274-5, 277 (6 Nov and 4 Dec 1843). The written 'Report' was read to the Managers on 18 Dec 1843 (ibid., IX.279).
(5) W.T. Brande and M. Faraday, 'Report on the proposed School of Practical Chemistry' (19 Dec 1843), p.1.
(6) Ibid., p.1.

the Government, and for the pure purpose of advancing science".(1) Brande and Faraday ended their 'Report' in an unusual way, suggesting that in order to show their approbation and "strong approval of the end proposed" that a formal statement of intent be made that could be used by the provisional Committee brought together to enlist supporters.(2) This statement of intent asserted that considering the "great object of the advancement of chemical Science, and of good to the community contemplated in the establishment of the proposed School", the Managers of the R.I. would be willing, provided sufficient financial support was forthcoming, to recommend to the Members of the R.I. "the appropriation of apartments in the house for the purpose of a scientific Laboratory for the School".(3) Brande and Faraday were clearly more than willing to overcome any obstacles. It should however be noted that although both men signed the document, it was clearly the product of Faraday's pen and bears the unmistakable hallmark of his style.(4)

The Managers arranged a meeting to consider the 'Report' the following day.(5) Special Managers' Meetings were a rare event and showed that something quite out of the ordinary was afoot. Fifty copies of the 'Report' were printed (again an unusual step),(6) the scheme had received a very promising reception and could very well have come to fruition. It is all the more surprising therefore when abruptly a week later the proposal was turned down, ostensibly for reasons of lack of space due to increasing stocks of apparatus, minerals and books.(7)

(1) Ibid., p.1.
(2) Ibid., p.3.
(3) Ibid., p.4.
(4) Faraday read the 'Report' to the Meeting of Managers, stating that it had not been "submitted to the approval of Professor Brande" as he had been detained giving evidence at a trial (Man.Min., IX.279 (18 Dec 1843)). At the Managers' Meeting on the following day, however, Faraday stated that the 'Report' "had been agreed to by Mr. Brande and himself" (ibid., IX.281 (19 Dec 1843)).
(5) Ibid., IX.279 (18 Dec 1843).
(6) Ibid., IX.281 (19 Dec 1843). The printing type of the 'Report' was ordered to be "left standing for the present".
(7) Man.Min., IX.282 (26 Dec 1843).

This was evidently a polite excuse since Brande and Faraday had themselves agreed that the space was adequate after consulting with the Institution's architect, and there were periodic clear-outs of old apparatus, and rearrangement of books on new shelves.(1) No direct evidence survives to give the true reason for this abrupt reversal. Some specific event in all probability precipitated it, and this may well have concerned the unimpressive and indeed somewhat dubious character and position of Gardner and Bullock. They were personally undistinguished people for the R.I. to become associated with. To those of the Managers in the well-established and highly reputable professions, they could well have been seen as adventurers, especially as close examination of their proposals reveals that while they wanted to secure the prestige of the R.I.'s name, they did not intend to allow anyone from the R.I. to hold a controlling position. Gardner proposed himself for the influential position of secretary of the scientific school, while Bullock was to run the practical laboratory.(2) Prudhoe voiced what was likely to be the Managers' general opinion: "With two such celebrated Professors as Mr. Brande and Faraday, I can see no reason for the Rl. Instn. to put itself into the hands of Dr. Gardner and Mr. Bullock".(3)

Moreover, the danger of incurring any additional financial liability was always a matter of acute anxiety to the Managers, and the proposals for funding the school held little promise of permanent success. R.I. Members were placed first on the list of those to whom appeal should be made for support, the others named being "2, Members of other Scientific

(1) Brande and Faraday 'Report', p.2. Examples of rearrangement of books and old apparatus may be found in Man.Min., IX.248, 360-1, 369 (6 Mar 1843, 17 Nov 1845, 2 Feb 1846).
(2) 'For a Practical Chemical School', p.5. Bullock offered his services gratuitously until the school was established, and then "upon such terms" as the Committee decided. Gardner also expected to be paid (ibid., p.5).
(3) Prudhoe to Barlow, 13 Dec 1843 (Box IXA. 121C).

Societies; 3, Agriculturists; 4, Manufacturers; 5, Medical men; and 6, Chemists and Druggists", with a further suggestion that a deputation should be sent to the Government.(1) Prudhoe, for one, was doubtful whether the latter would lend any support, "I have small hopes of the Board of Trade", and was also disturbed at the annual amount of money, of between £800 and £1000, estimated as the minimum necessary to maintain the school.(2)

Finally, there was the question of Faraday. Three years before in 1840 Faraday had suffered a complete breakdown in health, from which he did not recover for many months.(3) It was not until 1844 that he started serious research again, although he resumed lecturing in 1842. The proposal for a school of practical chemistry was made in November 1843, at a time when the Managers must have still wondered whether Faraday's breakdown was the prelude to increased ill health, or whether he would once more resume those researches that had brought him and the R.I. such fame. Were the school established, the Managers would probably have wished to see Faraday's name associated with it. What position he should have, titular head or director of the scientific school, are not clear, as the few references there are to the subject in Prudhoe's letters are confusing and nearly illegible.(4) Bullock and Gardner on the other hand, proposed a German as professor for the scientific school, a logical enough suggestion in view of their admiration for Liebig and Giessen.(5) If however Faraday had been approached, he had clearly

(1) 'For a Practical Chemical School', p.1.
(2) Prudhoe to Barlow, 30 Nov 1843 (Box IXA. 121C).
(3) In December 1840 Faraday was too ill to give the Juvenile lectures (Man.Min., IX.146 (7 Dec 1840)). See also Williams, <u>Michael Faraday</u>, pp.358-9.
(4) The chief reference appears in a letter of 27 Nov 1843, where Prudhoe appears to favour some connection of Faraday with the school, but "without any of the fatigue of exertion", presumably of administrative or teaching duties (Prudhoe to Barlow, 27 Nov 1843, Box IXA. 121C).
(5) 'For a Practical Chemical School', p.2. Prudhoe voiced a doubt whether a German would have sufficient command of the English language (Prudhoe to Barlow, 30 Nov 1843, Box IXA. 121C). In the

refused. It is possible that Brande would have liked the position, but the Managers felt that Faraday should take precedence. Brande however is most unlikely to have wished to resign all his other work in return for a suggested salary of only £250, less than half his salary at the Mint.(1)

On the other hand, if the Managers considered that Faraday would once more resume his experimental researches, there was good reason to turn Bullock and Gardner's proposal down. For close examination of the plans reveals a factor of startling importance, in retrospect at least, although it was not mentioned at all in any of the surviving documents. It was clearly stated in Brande and Faraday's 'Report', that "the present Laboratory of the Royal Institution with the room and cellars beyond it would be sufficient for the new school".(2) This meant displacing not only Brande's lengthy course of chemical lectures for medical students,(3) but far more important, Faraday's working laboratory. The main laboratory and adjacent lecture room

event, Liebig was asked to recommend one of his assistants for the Royal College of Chemistry, the outcome of this proposal, established in 1845 (A.W. Hofmann, 'A Page of Scientific History: Reminiscences of the Early Days of the Royal College of Chemistry', Quarterly Journal of Science, n.s.1 (April 1871), pp.146-7.

(1) Dr. Roberts suggests that rivalry between Brande and Faraday was a principal factor in the R.I.'s refusal of the proposal (op.cit., pp.151-4). However, Brande could never have been considered eligible for the position, which would have involved his resignation from the Mint and also of all his professional consultancy work, which was very considerable at the time (information received from Dr. Berman). Brande and Faraday's 'Report', stated unequivocably that "neither are its Professors and teachers to appear professionally in courts of law, or to enter into any such professional occupation, or give any professional advice or opinion, except to the Government of the country", which automatically excluded Brande ('Report', p.1).

(2) Brande and Faraday 'Report', p.2.

(3) Brande appeared satisfied that his lectures could be transferred to the Model Room (ibid., p.2).

would need to be fitted up with places for students, which would have involved a radical re-organisation of the space available.[1] Leading off the main laboratory was another small room where Faraday carried out many of his electrical and magnetic experiments.[2] It seems most unlikely that this room would have been left entirely undisturbed in view of Bullock and Gardner's proposed list of facilities, which, in addition to the main Laboratory, comprised six additional rooms (and a cellar for coals), the first of these being intended for "The Professor's private room and Laboratory".[3] Even if Faraday retained his small room, there would be little space or peace to carry on experimental work, unselfish though he was. Who, for instance, would have undisputed control of such pieces of equipment as the large furnace, which was in the main laboratory? The close proximity of students, the length of the school's hours, the sharing of facilities and equipment, would all provide incalculable hindrances.[4] No mention was made of provision for Faraday's work elsewhere. Nor

(1) Bullock and Gardner suggested that there should be space for thirty to forty students ('For a Practical Chemical School', p.1). A plan and view of the laboratory and lecture room may be found in A.D.R. Caroe, 'The House of the Royal Institution' (booklet, R.I., 1963), plate 1, p.20. This dates from 1819, but the laboratory and lecture room remained unchanged until 1863, and the general lay-out may be taken as accurate for the 1840s. Comparison may also be made with a water-colour by Harriet Moore, showing Faraday at work in the laboratory in 1851 (R.I., Faraday Museum).

(2) No plans survive of this room, which later became known as Faraday's magnetic laboratory, but Harriet Moore also painted a water-colour of it in 1851 (R.I., Faraday Museum), and a short description may be found in R. King, 'Michael Faraday of the Royal Institution' (booklet, R.I., 1973).

(3) 'For a Practical Chemical School', pp.2-3.

(4) It is not possible to ascertain whether there was independent access to this smaller room, or whether entrance was solely through the main laboratory. Bullock and Gardner suggested that

are there any indications that Faraday felt his own research career was over, although the fact that the Managers appeared willing to dispense with his main laboratory may indicate that they considered it was. They may even have ignored the question through ignorance of the need of equipment and undisturbed conditions for research work, until someone pointed out the problem. Or the Managers may have considered that Faraday's health would not be strong enough to support both the strain of research and some type of involvement in a school, not forgetting his normal administrative duties in the R.I., and the possibility of further fame descending on the Institution from Faraday's discoveries would therefore be remote. In the absence of evidence, the question of laboratory accommodation remains a frustrating mystery, especially as it may hold the key to the Manager's abrupt decision.

An opportunity for the R.I. to make a firm and practical commitment to formal scientific instruction was thus decisively rejected, and the laboratory of the Institution was preserved unaltered for two decades more, the remainder of Faraday's working life. No doubt too the Managers congratulated themselves on their foresight, as Faraday did

the school hours should be from 9.00 a.m. to 5.00 p.m. (ibid., p.5). It appears that Faraday's normal working day consisted of working by himself in the morning until dinner at 2.30 p.m., saving the afternoon for writing letters or scientific papers (J.H. Gladstone, Michael Faraday, pp.31-3). Presumably he did not work in the main laboratory while Brande gave his chemical lectures in the morning three times a week, as the lecturer's desk, placed under an archway, formed the division on one side between the laboratory and the lecture room. There is no indication however that Brande's lectures lasted longer than an hour, and the interruption to Faraday's undisturbed use of the laboratory was probably minimal.

indeed resume his experimental work, and moreover, Bullock and Gardner's later business careers demonstrated that they were equally interested in the commercial profits that could be obtained from an improved professional position.(1) Their proposal did indeed come to fruition two years later with the foundation of the Royal College of Chemistry in 1845, but their services were quickly dispensed with by the other more respectable and distinguished founders.(2) Brande and Faraday were both to be found among the supporters of the new College, which survived as a private enterprise in a state of acute financial difficulty until taken over by the Government and affiliated to the Royal School of Mines in 1853. Superficially a minor incident in the history of the R.I., it was in fact only narrowly that the Institution failed to become one of the grandparents of the institution that in due course became the Imperial College of Science and Technology.(3) Had such an event taken place at the R.I., and had the research laboratory been turned into a teaching laboratory, it can scarcely be doubted that a radical reorganisation of the Institution would have taken place. The rejection of the 1843 proposal was indeed a turning point for the R.I.

The Institution did not however yet abandon its commitment to formal scientific education. An indication of this may be seen in the readiness with which the Institution accepted a proposal in 1846 by

(1) When the Royal College of Chemistry was set up, both men continually sought to establish an applied department, and they also used the College's evening meetings as a platform for promoting patented products from which they stood to benefit (Roberts, <u>op.cit.</u>, pp.298-300).
(2) <u>Ibid.</u>, pp.301-4.
(3) For a brief account of the early years, see Sir Patrick Linstead, 'The Prince Consort and the Founding of the Imperial College', <u>Nature</u>, 193 (1962), 107-113.

Lord Seymour (the future twelfth Duke of Somerset) to give courses of lectures in the evening. Lyon Playfair was invited to give a course of lectures on Agricultural Chemistry on Tuesday evenings at 9.00 p.m.(1) The subject was certainly one of interest to the landed aristocracy, especially at this time, but for whom the course was intended is not known. It was however poorly attended, and the experiment of evening courses of lectures was not repeated.(2) A few years later the issues concerning the R.I.'s educational role were rehearsed with greater emphasis. On this occasion, the pressure came from within the Institution itself, and once again the issue concerned the R.I.'s educational role, with the challenge being made that this was indeed the R.I.'s most important function.

The differences of opinion arose over a minor issue; the provision of a laboratory assistant to help prepare the chemical lectures for medical students. These lectures, referred to earlier, otherwise known as "Mr. Brande's School of Chemistry", or the "Laboratory Lectures", had been conducted by Brande at the R.I. since his first appointment there in 1813. Their official status was uncertain, hovering somewhere between Brande's private sphere of activity and recognised institutional concerns. Brande was seen to have a proprietorial "vested interest" in the lectures,(3) while the R.I. received one-third of the proceeds, in effect a rent for the use of their facilities.(4) However, the long

(1) Man.Min., IX.375, 377 (2 and 16 Mar 1846).
(2) Average attendance was 90 people per lecture, considerably lower than at most afternoon Courses of lectures ('Index to Lectures' (1841-1912), p.46).
(3) This was briefly mentioned in a letter from Prudhoe to Barlow, 9 Nov 1843 (Box IXA. 121C).
(4) This was common in the first half of the nineteenth century, and may also be found in early university teaching laboratories. In 1847 the Managers decided to remit their third to Brande, evidently because the takings had diminished due to "the Establishment of other Chemical Schools", and also because of "the advantage derived by the Members from the Morning Lectures" (Man.Min., X.46 (15 Nov 1847)).

passage of time and the involvement of Faraday as well in the course, served to blur the distinction between private and institutional activities.

A brief description of these lectures is appropriate at the outset. They were given three times a week, from October to April, making a total of around eighty lectures in all.(1) Up to 1836 Brande and Faraday appear to have divided the course between them, each giving around half the total number of lectures.(2) From 1837 however Faraday gave only twelve to fourteen lectures during the early part of the course, until his health collapsed in 1840 and Brande took over. Faraday gave no more laboratory lectures from that time, and Brande in later years normally brought in someone from outside to help.(3) The majority of the students came from the two medical schools which succeeded the now defunct Great Windmill Street school where Brande had originally given the lectures before joining the R.I. many years before. These two schools served St. George's Hospital, which had not yet established its own medical school.(4) Bence Jones was one who attended the course, and another was Dr. Henry Power, later an ophthalmic surgeon at St. George's.(5) Dr. Timothy Holmes, another St. George's

(1) 'Index to Lectures' (1829-1841) and (1841-1912), passim. In the 1830s the Course was slightly longer, totalling around 95 lectures.
(2) 'Index to Lectures' (1829-1841), pp.33-139 passim.
(3) Edward Solly, chemist and Patron of the Library (see above, p.79), gave one-third of the lectures from 1842 to 1844; Thomas Griffith, lecturer in chemistry at St. Bartholomew's Hospital (where Brande had also been lecturer in chemistry from 1836 to 1841), gave six lectures in 1840, and about a quarter of the total number in 1845 and 1846 ('Index to Lectures' (1841-1912), pp.2-3, 13-14, 23-24, 32-33, 41).
(4) These were known as the Grosvenor Place School and the Kinnerton Street school. Students from the Grosvenor Place school certainly attended R.I. lectures, and probably also those from its rival, with which Sir Benjamin Collins Brodie, the eminent surgeon and a close friend of Brande, was closely involved (R.R. James, The School of Anatomy and Medicine adjoining St. George's Hospital 1830-1863 (1928), p.36; J. Blomfield, St. George's 1733-1923 (1933), p.49-50).
(5) Bence Jones, An Autobiography, p.13; Dr. Henry Power, A Brief Sketch of my Life (privately printed, 1912), p.22.

physician, wrote of the students' "inestimable privilege of obtaining their chemistry lectures from Mr. Brande at Albemarle Street, a privilege of which I have heard many of them speak with the warmest gratitude".(1) However the audience also included men who were not medical students, for example, Sir Roderick Murchison, the future director of the Royal School of Mines and an eminent geologist. In 1824 Murchison embarked on providing himself with a scientific education by attending Brande's course as a "necessary preliminary":

> Though chemistry never had strong attractions for me, I kept regular notes of the lectures on its various branches, and, at the end of my course, knew as much about that science as was necessary for a field-geologist. (2)

Murchison's need therefore was for a basic grounding in chemistry sufficient for competence in his chosen field of geology. W.F. Pollock, the cultured barrister already referred to several times, attended Brande's lectures for no reasons other than intelligent interest.(3) Pollock too used to attend the laboratory lectures on occasion in later years, and a comment he made then vividly expresses the appreciative but essentially non-scientific connoisseur:

> ... an experiment in which a vast cloud of amber smoke was driven like a column from a flask reminded me of the story of the Fisherman and the Genius in the Arabian Nights. It was very beautiful. We did not see it go into the vessel again as the fisherman did. (4)

Undoubtedly medical students formed the majority of the audience, but

(1) Dr. Timothy Holmes, Sir Benjamin Collins Brodie (1898), p.63. Holmes attributes this privilege to the close friendship between Brande and Sir Benjamin Brodie, but although this friendship dated from the time of their membership of the Animal Chemistry Club (1808), it is unlikely to have made any difference to Brande's desire to continue the lectures after his appointment in 1813 to the R.I.

(2) Geikie, The Life of Sir Roderick Murchison (1875), i.118.

(3) Pollock, op.cit., i.244.

(4) Ibid., i.272. This entry appears under the date 25 April 1849, when the lectures were given in the afternoon instead of in the morning (see below, p. 142).

nonetheless, these lectures did provide a basic scientific education for anyone who cared to seek it.(1) This helps to explain the wide-ranging nature of the course, which was clearly not designed as a specialist course for medical students alone. The content of the lectures naturally changed a certain amount as time went on, as Brande always endeavoured to incorporate recent scientific developments, and indeed complained of the amount of time he had to spend keeping up with new discoveries.(2) In the 1840s the four main parts of the course covered the general principles of chemistry, the non-metallic elements, metals and organic chemistry. There was particular emphasis on all the main practical applications of chemistry, even those which were of little apparent use to a medical student. For example, the syllabus of the 1847-48 session claimed that "the modes of assaying Ores are described, and their principal Mineralogical varieties illustrated by specimens", and went on to explain that not only were "the applications of Chemistry to Medicine and Pharmacy" dealt with, but also its applications:

> to the Arts and Manufactures, and to Agriculture and Economical Purposes, are discussed at some length in various parts of the Course, and the most important of them are experimentally exhibited.(3)

Indeed one has the impression that the aim was to produce in one session's lectures the "compleat" practical Chemist. But the students were also given a taste of pure science, as in the later 1830s at least, the subject of Faraday's contribution to the laboratory lectures was electricity.(4) Few medical students however appear to have found this

(1) See above, p.137 n.4, which indicates that by 1847 some R.I. Members at least did attend these lectures.
(2) Brande to the Managers, 7 Nov 1846, copied into Man.Min., IX.416 (16 Nov 1846).
(3) 'Plan of an extended and practical course of Lectures and Demonstrations on Chemistry' (1847-48), Guard Book, ii. (item 17).
(4) Faraday started the 1839-40 session, but after three lectures was obliged to give up as his health deteriorated. Brande took over the "Electricity Lectures", using Faraday's notes for the purpose (Brande to Faraday, 11 Oct 1839, Williams, Selected Correspondence, i.348), and in the 1840s electricity was certainly an integral part of the course, as shown by the 'Plan ... of Lectures and Demonstrations on Chemistry' of 1847-48.

useful, as Bence Jones noted: "Those lectures of Mr. Faraday's, beautiful as they were, were of small use to medical pupils, who could not see much connection between electrical induction and the action of drugs".(1)

Not surprisingly, the popularity of the course by the mid-1840s had declined dramatically, and attendance was less than half of what it had been a decade earlier.(2) Furthermore, by this time practical courses in the applications of chemistry to medicine were becoming available in the hospital training schools for those students who wished solely to acquire proficiency in chemical manipulation for the preparation of drugs, or in basic methods of analysis.(3) Nor was it surprising that by the end of the 1846-47 session, the ageing Brande found the lengthy course a strain and wished to give it up, offering rather reluctantly if necessary to resign his professorship of chemistry as well.(4) St. George's Hospital was however unwilling to let the course lapse, and after consultations between the Managers and the Hospital, it was agreed in May 1847 that Brande would continue the course, aided by Benjamin Collins Brodie.(5) Brodie (1817-1880), the son of the eminent St. George's surgeon of the same name, was already familiar with the R.I., having been a Member since 1842. He had been trained at Giessen, and by 1847 had set up his own laboratory in London to pursue chemical researches.

(1) Bence Jones, An Autobiography, p.13.
(2) In 1838-39 attendances had totalled 12,345, but had dropped by 1846-47 to 4,869 ('Index to Lectures', (1826-1841),pp.139-41, (1841-1912), pp.48-50).
(3) For example in July 1843 a course of practical chemistry was added to the chemical course already given at the Grosvenor Place School, and in 1844 further courses were added on the microscope, and on chemistry as applied to physiology and pathology.
(4) Brande first announced his intention of giving up the course at the end of the following session in November 1846, and reiterated his wishes in April 1847 (Man.Min., IX.416 (16 Nov 1846), 461-3 (19 Apr 1847)).
(5) Man.Min., X.1-2 (1 May 1847).

A year later in April 1848, at the end of the first joint Brande and Brodie session, significant alterations were made. The course was reduced from the normal eighty lectures to only twenty-five; the time was changed from 9.00 a.m. to 10.00 a.m.; R.I. Members were to be admitted free of charge, while the cost to the general public was fixed at 2 gns.; and finally Brodie was appointed the "Morning Lecturer" at a salary of £100 p.a.(1) In all probability these changes were designed to relieve Brande of any further work in connection with the course.(2) In effect, and far more important, the result was to incorporate the course into R.I. activities for its Members, the Institution even assuming financial responsibility for it. Furthermore, a couple of months later, the time of the lectures was changed to the afternoon at the request of a Member, presumably in order to make it more convenient for R.I. Members to attend.(3) The supposition then follows that medical students formed a smaller proportion of the audience, ~~while~~ and R.I. Members and non-scientific men a larger proportion, which helps to explain the serious differences of opinion over the course that arose a year later at the end of the 1848-49 session.

In July 1849 Brodie wrote a long letter to Faraday explaining his views on "the means of rendering useful and efficient the Laboratory lectures as a course of scientific instruction".(4) He criticised the R.I.'s lack of assistance, especially when organic chemistry needed someone with a trained knowledge to prepare the experiments and necessary compounds. He suggested that the R.I. should get an assistant for the laboratory lectures, a post worth about £80 p.a., as well as supporting

(1) Man.Min., X.83 (3 Apr 1848).
(2) Through Faraday, Brande had reiterated his "necessity" to give up the laboratory lectures at the end of the session (ibid., X.71 (21 Feb 1848)).
(3) Gen.Min., V.434 (5 June 1848), confirmed in Man.Min., X.132-3 (6 Mov 1848).
(4) Brodie to Faraday, 7 July 1849, Institution of Electrical Engineers, Faraday MSS (hereafter cited as I.E.E. Faraday MSS).

other expenses of about £50 p.a. In the two previous years Brodie had had to use his own private assistant to help with the experiments and chemical preparations. The Managers were however unwilling to incur any extra expense, as Faraday replied to Brodie.(1) Brodie then accused the Managers of being "parsimonious and inconsiderate".(2) Faraday replied defending the Managers, and discussed the type of lecture best suited to the course, but not the question of money.(3) In later correspondence Brodie however refers to changes in the method of payment as "only a detail",(4) the real question at issue being the purpose and character of the lectures. On the Managers' side, the question of money does not appear directly in any of the correspondence, except in Faraday's first letter to Brodie of the 9th July 1849. The Managers never regarded money as an unimportant detail, but in this case financial considerations were only a secondary factor, their chief concern being the character of the lectures. Brodie in reality clearly regarded payment not as an irrelevant detail, but more in the light of the last straw, the incomprehensible failure of the Managers to aid science, in the way that Brodie naturally thought best.

What then were these differences over the main issue, the character of the lectures? Brodie felt that they should be "strict logical expositions of chemical science",(5) and for example objected to being asked to use fewer chemical symbols, complaining that chemistry could not be "rendered instructive or even intelligible" without them.(6) He wished to include some demonstration of methods of research, and asserted that:

(1) Faraday to Brodie, 9 July 1849 (I.E.E. Faraday MSS, marked in Faraday's hand, "Copy. Private").
(2) Brodie to Faraday, 10 July 1949 (I.E.E. Faraday MSS).
(3) Faraday to Brodie, 16 July 1849 (Williams, Selected Correspondence, ii.558-9).
(4) Brodie to Rev. John Barlow, 29 Nov 1849 (R.I. MSS, Box XIV.142).
(5) Faraday's words summing up his understanding of Brodie's opinions, in his letter to Brodie of 16 July 1849.
(6) Brodie to Barlow, 29 Nov 1849 (Box XIV.142).

> For the diffusion of knowledge the Institution does a good deal, while for the higher end of promoting by instruction, exact science, it does very little. Yet this appears to me to be one of its functions implied in the existence of its laboratory and Professorships. (1)

In the Managers' view Brodie was aiming at a level which was far too advanced, certainly for R.I. Members. Barlow ventured to suggest that the lectures were intended for a more popular audience, for "men of business", a phrase which incensed Brodie, and which he contemptuously dismissed.[(2)] Barlow qualified his words, but persisted:

> What we stated as the Managers' view was that the Lectures being intended not for Chemical students, but for men of business belonging to different Professions who have not made chemistry their study, these lectures might be adapted to such an audience and that this could be done without derogating at all from the scientific character of the lectures. (3)

A recurrent feature of the mid-century was the disagreement between professional scientist and amateur as to what constituted the "scientific character" of a lecture or a book. Brodie refused to direct his lectures at the average R.I. Member, the man of business, and meetings between Brodie, Barlow and W.R. Grove (a Manager that year) failed to resolve their differences.[(4)] Brodie left the R.I. and in December 1849 Brande was asked to take on the lectures once again. Grove indeed played an important role in the final stage of the dispute, as the Draft Minute Books reveal that it was Grove who formulated the final version of the minute terminating the dispute, a version that left no room for compromise on either side.[(5)]

(1) <u>Ibid</u>.
(2) <u>Ibid</u>.
(3) Barlow to Brodie, 29 Nov 1849, marked "Copy" in Barlow's hand (Box XIV.142).
(4) Barlow to Brodie, 29 Nov 1849; and Man.Min., X.212, 220, 228-9 (5 Nov, 19 Nov, 11 Dec 1849).
(5) R.I. MSS, Draft Managers' Minutes, I. (11 Dec 1849). A paper in Grove's hand is pasted in this volume, which is not paginated, and this version replaced that of Barlow which had already been copied into the official Minute Book, and was crossed through (Man.Min., X.229 (11 Dec 1849)).

Three differing conceptions of the R.I. emerged in this incident. The first was that of Brodie, who viewed the R.I. as an institution for scientific education, where he had been engaged to give lectures of a "scientific character ... of a class and tone which would or ought to be given in a place of scientific instruction",(1) and where he was solely interested in providing formal instruction at an advanced level. This view was decisively repudiated, and it was in any event a view that was chiefly the projection of Brodie's own ambitions. He found the right niche a few years later in 1855 as Professor of Chemistry at Oxford. The second view was that of Brande and the Managers. On the one hand they agreed that an involvement in education was right and proper and liked the R.I.'s reputation in this sphere. As they had said as recently as 1846:

> they desire to record their conviction that much of the reputation which this Institution has ever maintained as a School of Chemistry is due to the great acquirements, and the singular ability in imparting knowledge for which their Professor (Brande) is so highly and deservedly celebrated.(2)

But they miscalculated their audience when they started providing for the general body of their Members the type of course previously intended for medical students. Brodie exacerbated the misjudgement by raising the standard of the lectures to a considerably higher level.(3) Better suited to the Members was that loosely defined diffusion of knowledge, a view admirably expressed by Brande:

> I have seen nothing to shake my opinion that the main objects of the Royal Institution are not to teach the minutiae of practical chemistry to persons who are following it professionally, or in detail, but to diffuse a general taste for the science (of chemistry). (4)

(1) Brodie to Barlow, 29 Nov 1849 (Box XIV.142).
(2) Man.Min., IX.417 (16 Nov 1846).
(3) It was clearly realised that Brodie had raised the standard, as the Visitors referred to the "more Elementary Course" that Brande used to give, which was now replaced by a "New Course ... intended to be of a more elevated character" (Annual Report (1849)).
(4) Brande to Brodie, 7 Nov 1849 (Box IX.122E).

The third view of the R.I.'s main purpose was that of Faraday, who, loyal servant of the Managers that he was, tried unsuccessfully to resolve the differences between Brodie and the Managers, while keeping the best interests of science at heart as well as those of the R.I. With his usual clarity, he summed up the different views and asserted what indeed should be the true raison d'etre of the laboratory (and one is made to pause a moment and wonder that England's premier scientist should have had to explain the objectives of his laboratory). Faraday submitted his views to the Managers after Brodie first wrote to him of the need for assistance in July 1849. He drew up an account of the money spent on salaries and lectures in the laboratory, and outlined the "Objects to be attained by the Expenditure of Funds".(1) There were three: firstly, "The advantageous influence of the high character of the men who are connected thereby with the R.I.", in other words, the need to maintain the Institution's scientific reputation; secondly, "Lectures for the Members acceptable to a sufficiently large number of them", a phrase that indicates a suitable compromise on the level of difficulty of the lectures.(2) But above all else, the true objective of the Institution was the

> Advancement of science for its own sake; i.e. without reference to its result in character or its acceptation by a sufficient number of Members in the form it may for the time assume. (3)

It is extraordinary to realise that this was a novel assertion. Neither Brodie nor Brande ever mentioned research as a primary objective of the Institution. Brodie indeed complained how difficult it was to teach in a research laboratory: "Were the Laboratory of Research of

(1) Man.Min., IX.208 (9 July 1849); note in Faraday's hand pasted in Draft Managers' Minute Book, I.
(2) Ibid., p.208.
(3) Ibid., p.208. The order in which Faraday listed the "Objects" reflects his tact in dealing with the Managers, rather than his own order of priorities.

the Institution in daily and active operation as a chemical laboratory these difficulties would not arise".[1] Brande mentioned research as an afterthought, as something which did not interfere with the lectures.[2] Significantly too, the Managers added no formal endorsement to Faraday's statement cited above. If Brodie had remained at the R.I., and moreover if he had been appointed as successor to Brande when the latter finally resigned three years later in 1852, he would have undoubtedly emphasized formal instruction as a main objective. The R.I. might then have become the type of school which had been proposed only a few years earlier in 1843. Both Faraday and Brande felt that Brodie's ideas were only feasible in the context of a formal school such as did not exist at the R.I. As Brande wrote to Brodie:

> I must candidly tell you that I think you are aiming at that which in our Laboratory cannot ultimately succeed, unless it included all the machinery and appurtenances of a practical School, and became altogether a distinct branch of the Institution with pursuits and pupils like those of the Hanover Square College (i.e. the Royal College of Chemistry). (3)

But the incident was more than simply a rejection of any formal academic role for the Institution. For the first time Faraday had publicly and explicitly stated the primary objective of the R.I. to be the "<u>advancement of science for its own sake</u>", not for any immediate utilitarian purposes nor for any interested party. This assertion was a world away from those laboratory analyses of the 1820s, and furthermore, highlighted the tension between the more general educative aspect of the R.I.'s activities, with the endless lecture courses that this entailed, and its function as a research institution. The dispute indeed marked too the end of the R.I.'s role as a school of chemistry

(1) Brodie to Barlow, 17 Nov 1849 (Box XIV.142).
(2) Brande to Brodie, 7 Nov 1849 (Box IX.122E).
(3) <u>Ibid.</u>, 7 Nov 1849. Faraday likewise felt that Brodie's type of lecture was "of little practical or influential character except in association with a practical school" (Faraday to Brodie, 16 July 1849, Williams, <u>Selected Correspondence</u>, ii.559).

and a place of scientific instruction. The course was not finally abandoned until after the resignation of Brande in 1852,(1) but henceforth the formal educative function disappeared, leaving an as yet unresolved tension between the general educative activities prescribed by the diffusion of useful knowledge, and the pursuit of disinterested research.

A co-incidental result was that the dispute also brought into the R.I.'s orbit the two men who were to be the decisive figures in the next phase of the Institution's history. As physician at St. George's, Bence Jones was responsible for making the original arrangement in 1847 that the laboratory lectures would be continued.(2) In 1849 he became a life Member, and in 1851 himself gave the laboratory lectures for no fee, but insisted that his medical students be admitted free of charge, thereby ensuring that the lectures were given to the audience for whom they had originally been intended.(3) Furthermore, it was Bence Jones who was the person who first introduced the then almost unknown John Tyndall to the R.I., by inviting him to give a Friday Evening Discourse, and then by acting as go-between for Tyndall and the Managers, he added all the forcefulness of his energetic persuasions to induce Tyndall to accept the Professorship of Natural Philosophy.(4) When he became Secretary in 1860, Bence Jones took Faraday's assertion of the R.I.'s primary function and endeavoured to make it a lasting reality, and Tyndall as Faraday's heir became the model of the disinterested research scientist that the Institution

(1) Brande gave the 1850 course. The following three years an outsider was engaged to give what became a specialised course on one aspect of chemistry: 1851, Bence Jones on 'Animal Chemistry'; 1852, C.B. Mansfield on the 'Chemistry of the Metals'; and in 1853 Augustus Hofmann on 'Organic Chemistry'. The syllabuses for these courses may be found in Box V (100) containing printed lecture syllabuses.
(2) Man.Min., X.1 (1 May 1847).
(3) Ibid., X.267-8 (3 June 1850).
(4) See below, pp.151-2.

desired to support.

It is significant that in 1851, a year after the Brodie dispute, the Managers brought out a revised 'Prospectus' of the R.I. outlining its objectives and facilities. So far as investigation has shown, it appears that no prospectus had been issued since 1830, when the objectives of the R.I. were stated in the same terms as in the original Charter, namely, "to diffuse the knowledge, and facilitate the introduction of useful inventions and improvements; and to teach by courses of lectures and experiments, the application of science to the common purposes of life".(1) In 1851 the wording of these objectives was revised, and appeared in very different terms:

I. To further Scientific Research;

II. To teach the principles of Inductive and Experimental Science;

III. To exhibit the application of these principles to the various arts of life.(2)

It is true that a formal educative function was still maintained, an assertion which continued to cause confusion, but to list scientific research at all, and to list it as first among the R.I.'s objectives was indeed a significant change. The facilities listed after the object-

(1) This document appears in a booklet entitled 'Syllabus of Lectures' 1830, Guard Book, i. (the items in vol.i. are not numbered).

(2) 'Prospectus', bound with the Visitors' Annual Report for 1850, in the volume of 'Membership Lists'(1851-54). The Visitors drew up their Annual Report in April of each year. Their 1850 Annual Report was therefore drawn up and presented in April 1851, and presumably the 'Prospectus' was also drawn up at the same time. I have therefore dated the 'Prospectus' to the year it was drawn up, that is, the year following that of the Annual Report with which it is bound. The only copy of this 'Prospectus' (and those of the next twelve years) that survives was printed with the Annual Report (the pages are numbered consecutively) and bound into the 'Membership Lists'. It is not included in the printed Annual Reports bound into the volumes of the Visitors' Minutes. Furthermore, the document is not called a 'Prospectus' until 1863, and is simply headed 'The Royal Institution of Great Britain', but I have termed it 'Prospectus' throughout to avoid confusion.

ives did not however reflect quite the same order of priorities, for the first named was "A THEATRE FOR PUBLIC LECTURES", followed by "A LABORATORY for the promotion and advancement of Chemical and Electrical Science".(1) Then came in order: "LABORATORY LECTURES ... designed for the further instruction of persons already acquainted with the principles of Chemistry", "A LIBRARY", "A MUSEUM", "READING ROOM" and "WEEKLY MEETINGS OF THE MEMBERS OF THE INSTITUTION".(2)

However, no sooner did the Institution take one step forward towards defining priorities, than it took a step sideways to blur the main issue. The 'Prospectus' issued the following year, 1852, altered the first objective, left the second and third as they were, and added a fourth:

> I. To promote Scientific and Literary Research;
>
> II. To teach the principles of Inductive and Experimental Science;
>
> III. To exhibit the Application of these Principles to the various Arts of Life; and
>
> IV. To afford Opportunities for Study.(3)

The last may refer simply to polite learning rather than to students applying themselves to academic studies, but most significant of all is the transmutation of the first objective from "To further Scientific Research" into "To promote Scientific and Literary Research". This was a return to the older tradition, to the older use of the term in the dual, all-embracing sense described earlier.(4) While this was indeed an accurate description of the R.I. as a cultural society covering the whole field of learning, it was a rejection of a single-minded devotion first and foremost to scientific research. Indeed, it has

(1) 'Prospectus' (1851), p.iii. (Annual Report 1850, in 'Membership Lists' (1851-54)).
(2) Ibid., p.iv.
(3) 'Prospectus' (1852), p.iii. (Annual Report 1851, in 'Membership Lists' (1851-54)).
(4) See above, pp. 14, 58.

always proved impossible for the Institution to make such a single-minded declaration, for even in the present day, the Institution's objectives are phrased in the same terms, "In general, its objects are to prosecute scientific and literary research".(1) It is clear too that even though scientific research was inserted at the head of the list of objectives, the implications of that recognition were not yet fully realised by all the Managers.

A major decision was soon called for. In 1852 Brande left the Institution where he had spent nearly forty years.(2) A successor had to be found, one too who would probably inherit the mantle of Faraday, and in whose talent for research and appeal to the public the R.I. could safely entrust its future. Thanks to the activities of Bence Jones and the warm encouragement of Faraday, a man was found who was both highly acceptable to the Managers, and whom Faraday and Bence Jones were confident would employ his energies first and foremost in research, and this was of course John Tyndall. Bence Jones first heard of Tyndall through his friend, Emil du Bois Reymond, the Berlin physiologist.(3) Tyndall had by that time returned from his studies in Germany, to become a schoolmaster at the Quaker academy of Queenwood in Hampshire.(4) Bence Jones, with characteristic impetuosity, promptly obtained the Secretary's consent to invite Tyndall to give a Friday Evening Discourse at the R.I.(5) Tyndall accepted, and the Discourse in February was by all accounts a great success.(6) Ten days later

(1) Record of the Royal Institution (1968), p.5.
(2) Brande would probably have stayed longer if not obliged to resign by changed conditions at the Mint (see above, p. 68).
(3) Bence Jones, An Autobiography, p.29.
(4) See Eve and Creasey, op.cit., pp.18-34, for Tyndall's first engagement at Queenwood, his stay at Marburg in Germany and return to Queenwood.
(5) Bence Jones to Tyndall, 19 Oct 1852 (Tyndall, Correspondence, 14/F2.1). Barlow to Tyndall, 21 Oct 1852 (ibid., 6/B1.1).
(6) See for example, Bence Jones' description in An Autobiography, p.30.

Tyndall was invited to give a Course of four lectures.(1) Soon the possibility of a permanent appointment arose, and between the beginning of March and the end of May 1853, a series of letters on the subject passed between Bence Jones and Tyndall. The chief obstacle to Tyndall's acceptance was the small salary offered by the R.I.(2) After much thought, Tyndall accepted £200 p.a., the same as his Queenwood salary, with the promise of more when available.

Tyndall's appointment as Professor of Natural Philosophy in May 1853 was thus the first result of Bence Jones' ability to take the initiative. At times one has the impression that Bence Jones was already running the R.I., although that would be an exaggeration. Without his efforts, however, Tyndall might well not have joined the R.I. There were other offers open to Tyndall at the same time, notably from the London Institution.(3) Bence Jones' letters to Tyndall show evidence of skilful persuasion. He was also fully supported by Faraday, who gave his "full approval and generous help",(4) and the letters to Tyndall reveal that Bence Jones consulted with Faraday more often than with the Managers: "I saw Mr. Faraday today and had a long talk with him about you. <u>He is most anxious you should come to the Institution</u>."(5) Bence Jones did not in fact become a Manager until May 1853, and Faraday would have had to put any proposals officially to the Managers at their meeting. But it is no exaggeration to say that the two of them together settled the appointment. Even before he became a Manager, Bence Jones'

(1) Tyndall's Discourse 'On the Influence of Material Aggregation upon the Manifestations of Force' was given on 11 Feb 1853 (<u>P.R.I.</u>, i (1851-54), 254-9); he was invited to give a Course of lectures on 22 Feb 1853 (Man.Min., X.424 (22 Feb 1853)).
(2) Bence Jones to Tyndall, 8 Apr 1853 (Tyndall, Correspondence, 14/F3.12).
(3) J.P. Gassiot hoped that Tyndall would go to the London Institution, but it appears that the London Institution was even less generous on the question of salary than the R.I. (Bence Jones to Tyndall, 11 and 21 March 1853, <u>ibid</u>., 14/F2.9, 14/F3.10; and information from Miss J. Cutler).
(4) Bence Jones, <u>An Autobiography</u>, p.30.
(5) Bence Jones to Tyndall, 8 Apr 1853 (Tyndall, Correspondence, 14/F3.12).

influence was evidently decisive in R.I. affairs.(1)

Without doubt Bence Jones and Faraday found Tyndall a very attractive candidate because they both realised that Tyndall's chief ambition was to pursue original research. Not yet widely known, he had already made some mark, daring even to disagree with Faraday on some aspects of diamagnetism.(2) Since 1850 he had corresponded at intervals with Faraday on the subject of magnetism, had published several research papers, was elected an F.R.S. in 1852, and had read papers at the British Association.(3) With his advanced German scientific training, he looked a thoroughly promising young scientist, and Faraday and Bence Jones were well impressed by the quality of his work.(4) Everything else came second to research. As Tyndall later recorded Faraday saying: "Lectures must be given, but he (Faraday) wanted me for science".(5) Faraday recommended Tyndall's appointment to the Managers with particular warmth, noting that he was "an original and successful investigator", that "he has written several papers on research highly acceptable to philosophers", besides being an excellent lecturer.(6) It is also

(1) In June 1853, shortly after Bence Jones first became a Manager, Faraday's salary was raised for the first time in nearly forty years, from £100 to £300 (Man.Min., XI.21 (6 June 1853)). There is no evidence that Bence Jones suggested this, but considering the views he expressed later on the need to pay adequate salaries, it is very possible that the proposal originated from him.

(2) In his first Discourse at the R.I. in February 1853, Tyndall maintained contrary to Faraday's views, that magnetism in bismuth was not inherent but induced by a magnetic field (Eve and Creasy, op.cit., p.40).

(3) For their earlier correspondence, see Faraday to Tyndall, 19 Nov 1850, 19 Apr 1851 and 1 Aug 1851, and references in Faraday to J. Plücker (German physicist and mathematician) 10 Oct 1850, and Faraday to G.B. Airy (Astronomer-Royal) 5 Sept 1851 (Williams, Selected Correspondence, ii.597, 623, 641-2, 592-3, 643). Tyndall had published work in the Philosophical Magazine, Poggendorff's Annalen, and the Bibliotheque Universelle (R.S.C.S.P., VI.75), and read papers to the British Association in 1850, 1851 and 1852 (British Association, Annual Report (Transactions of the Sections) (1851), 23; (1852), 15-18, 26-7; (1853), 20-21).

(4) For example, in January 1853 Bence Jones asked Tyndall whether he would write a manual on electricity (Tyndall, Correspondence, 14/F2.4).

(5) Tyndall, Journal VIa, p.427 (22 Apr 1857).

(6) Man.Min., XI.13-14 (23 May 1853).

significant that neither Faraday nor Bence Jones made any mention of Tyndall's schoolmaster background, an omission that implies that they considered his experience in formal scientific instruction to be quite unimportant.

Nor indeed did the Managers ever mention Tyndall's experience as a schoolmaster. The mistakes of the Brodie incident had been well learnt, and they did not want another "instructor". While no doubt they applauded the worthy objectives of research, there were not many among the Managers at that time, excepting Wheatstone and Grove, able to assess the quality of Tyndall's work.(1) It is more likely that they were influenced by Tyndall's evident ability to lecture extremely well, that essential qualification for an R.I. professor. Accustomed to Faraday's superb lectures, they would be good judges of that talent. The Managers insisted on a fairly substantial number of lectures, nineteen each season, which served as a fair replacement for the laboratory course of lectures. The diffusion of knowledge, by means of lectures, would therefore be at least equally well served as the needs of research.

In Tyndall's case too the emphasis on research was less threatened than had hitherto been the case by outside demands for scientific expertise, for Tyndall came to the R.I. as a research scientist, unencumbered by any background of experience in the practical application of science. This was not only because he was a physicist and not a chemist, but also because he did not regard himself as under an obligation to anyone so far as his scientific work was concerned. He demanded unquestioned freedom of action within the laboratory, a freedom that appeared circumscribed by the Bye-law then still in force, ordering the Professors "to superintend all Experiments ordered by the Committee of Managers".(2)

(1) Tyndall was known to Grove, who signed his certificate for election to the Royal Society (Tyndall to Grove, 23 Feb 1852, R.I. Grove MSS).
(2) R.I. Bye-Laws, xix.art.5.

Tyndall bluntly refused to do research to order, and while agreeing to fulfil the lecture programme, trusted that otherwise he would be allowed complete freedom of action.(1) Evidently he was reassured on this point, for no more was heard of the question. Tyndall was thus free to concentrate on his research (insofar as his lectures permitted) at a time in the 1850s when Faraday was in greater demand than ever as a scientific expert. As the volume of his own research declined, Faraday gave his time and advice to a wide variety of problems of practical science. He acted as a juror at the Great Exhibition for the mining and mineral products class of exhibits, advised on the preservation of pictures in the National Gallery, and devoted much time to improvements in lighthouse illumination.(2) Tyndall indeed succeeded Faraday in 1865 as Scientific Adviser to Trinity House, but this was one of the very few cases where he was directly involved in problems of applied science. Investigation has shown only one instance in the 1850s, when Tyndall was asked to examine the cause of a boiler explosion.(3) When he did work that had immediate practical application, as for example in his later investigations into bacteriology (where the practical application of his work survives in the French language as "tyndallisation", which is a form of pasteurisation), this was not undertaken for particlar bodies or individuals, but was part of his own personal campaign in the service of scientific truth. As J.G. Crowther points out, Tyndall's efforts to promote science among people were theological in character,

(1) Tyndall to Bence Jones, 5 June 1853, copied into Man.Min., XI.17 (6 June 1853).

(2) Official Catalogue of the Great Exhibition (corrected ed. 1851), p.319; Faraday referred to the time taken up with "the exhibition Jury work" in a letter to A. de la Rive, 5 June 1851 (Williams, Selected Correspondence, ii.634). On his work for the National Gallery and Trinity House, see Williams, Michael Faraday, pp.479-91.

(3) Tyndall, Journal VIa, 17-18 (15 Feb 1855); Tyndall undertook this work at the behest of Colonel Wynne, an official at the Board of Trade, who was an old friend of Tyndall's since his surveying work in the 1840s. One should perhaps also mention that Tyndall served as a juror at the Paris Exhibition in 1855.

the battle of the true doctrine against false heresies.[1]

However, research needed adequate conditions for work with regard to time, facilities and remuneration, and in none of these three areas was the R.I. conspicuous for liberality. Even Tyndall's one obligation to give a Course of nineteen lectures began to conflict with time to pursue research, partly on account of the need to supplement his salary by lecturing elsewhere and doing examination work. By 1858, nearly five years after he had joined the R.I., Tyndall found the strain of the lectures had become a burden on his time, and consequently, on his health.[2] It was proposed that Bence Jones ask the Managers to reduce the length of the Course on the grounds of the ill effects on Tyndall's health.[3] Tyndall then objected, saying it would compromise his independence by making him appear a burden on the Institution. He wrote in these terms to Faraday, saying also that he felt he deserved better of the R.I. when he had refused various flattering offers in the preceding years, and "inducements held out" of higher pay when he joined the R.I. had not been kept.[4] Upset by Tyndall's attitude, Faraday explained his own very modest financial position. They agreed between themselves to get the number of lectures reduced on scientific grounds, not because of ill health.[5] Faraday's skilful phrasing of the official Minute is a pleasure to read; "Considering ... his successful exertions, both mental and bodily, in the development and accumulation of original scientific research" obliquely referred to the strains on Tyndall's health, and carefully underlined his achievements in research; and

(1) J.G. Crowther, Scientific Types (1968), pp.157-8.
(2) In the previous year Tyndall asked Faraday if the burden of lecturing could be reduced (Tyndall, Journal VIa, 421-3 (18 Apr 1857), 427 (22 Apr 1857)). Evidently Faraday had not been able to do anything about it, as nothing more was heard for a year.
(3) Tyndall, Journal VII, p.274 (19 Feb 1858).
(4) Ibid., pp.274-5. Tyndall undoubtedly wrote to Faraday in these terms, but he crossed through the passage in his journal, feeling no doubt shamed by Faraday's unselfseeking attitude.
(5) Ibid., p.276 (20 Feb 1858).

"believing that to be the highest though not the only object of one holding his chair", Faraday once again emphasized that research was the most important objective of the R.I., without antagonising the Managers by ignoring the other objectives.(1) Tyndall's Course was reduced from nineteen to twelve lectures. A few years later in 1862 the Managers allowed Tyndall to suspend his lectures altogether for the duration of his current investigations, a hitherto unheard-of concession.(2)

Bence Jones was well aware too of the problems posed by inadequate salaries. People could not be expected to do research purely for the love of it, not least because those with considerable ability, such as Tyndall, were frequently from humble backgrounds and had no private resources. Bence Jones ensured that Tyndall's salary was raised from £200 to £300 in March 1859,(3) none too soon, as Tyndall was tempted by the highly paid professorship of natural philosophy at Edinburgh, and, although he finally declined to stand for election at Edinburgh, he still accepted a teaching post at the Royal School of Mines in November of that year.(4) When Bence Jones finally became Secretary in 1860, the stage was set for one of the most successful and lively decades in the R.I.'s history. Even the official Managers' Minutes have a life and animation about them which must reflect a directing sense of purpose. In great measure the achievements of these years were due to Bence Jones.

(1) Man.Min., XI.220 (1 Mar 1858); original note in Faraday's hand pasted in Draft Managers' Minutes (1855-62).
(2) Man.Min., XI.444 (7 July 1862).
(3) Man.Min., XI.264, 266 (21 Feb and 7 Mar 1859). The Minutes state that Bence Jones "gave Notice, that, at the next Meeting, he should move" an increase in Tyndall's salary to £300 p.a. This was the customary way a Manager indicated that he strongly wished a certain course of action to be taken, and allowed time for any discussion before the next Meeting.
(4) The Edinburgh professorship was worth £1250 p.a. Tyndall decided in the end that he was more in the heart of things in London, and Sir Roderick Murchison, the Director of the Royal School of Mines, enthusiastically promised improvements in Tyndall's facilities at the R.S.M. (Murchison to Tyndall, 21 Nov 1859, copy in Tyndall's hand, Journal VIIIa, pp.79-81).

He lost little time in coming to grips with the Institution's problems, assessed the situation, defined objectives and the means of attaining them, and embodied these in his Report on the Past, Present, and Future of the Royal Institution, chiefly in regard to the Encouragement of Scientific Research (1862).[1]

Bence Jones' Report detailed the original objectives of the R.I., the sums paid to its Professors from the date of its foundation to the present day, and finally, the changes which had taken place generally with regard to the wider diffusion of scientific and useful knowledge, with particular reference to the universities and Government supported colleges and museums. Bence Jones' conclusions were clear. At the time of its foundation the R.I.'s purpose had been "the extension of education in natural knowledge", but this had now quite changed to become original scientific investigation.[2] Education, he asserted, was well catered for elsewhere (although some contemporaries would have disagreed). The R.I.'s Professors stayed only because they were able to carry on research, although they were badly paid by comparison with, for example, Government scientists. "Research is the glory of the Institution, and to promote research should be its chief aim".[3] Therefore the R.I. must appoint as its Professors only those men who would do the most research. They should be allowed the maximum amount of time for research, apparatus should be provided, and last and most important of all, they should be paid enough to enable them to live on their R.I. salaries, and not to be obliged to lecture or take part-time posts elsewhere: "But can our Professors now LIVE on what they receive from the Institution?"[4] Bence Jones briefly listed some of the discoveries made at the R.I.,

(1) Privately printed for circulation to R.I. Members (hereafter cited as Bence Jones, Report). A copy may be found in Guard Book, iii.item 52, and another bound in Man.Min., XI between pp.415-6.
(2) Bence Jones, Report, pp.3-4.
(3) Ibid., p.9.
(4) Ibid., p.10.

and appealed "by sixty years of grand discoveries" to the Members for their liberality.(1)

Bence Jones' Report was forcefully written and persuasively argued, although he over-emphasized the case for the spread of education and the amount of Government money spent by including for example the national art collections in "Sums actually expended ... for Scientific Education and connected matters".(2) He also wrote rather wildly of salaries of "eleven, twelve, or fifteen hundred a year" offered to those engaged in Government science; there were in fact only four posts open to scientists in Government service in England with salaries over £1000 p.a.(3) None-theless it is an extremely important document with regard to the R.I. Bence Jones hammered home as never before the argument that research was the primary function of the Institution, and that the R.I.'s con-tinued success itself depended on research. Equally, the Report clearly spelt out the converse, that education and the diffusion of knowledge were not the Institution's prime objectives, for "if this were its only work, it would, before long, be obliged to yield to other more richly-endowed places of instruction".(4)

Bence Jones' views however did not command uncritical acceptance, either from the Members or from all the Managers. He sent a draft of the Report to at least some of the Managers before presenting it form-ally to the Board.(5) In any event, it would have to meet with general approval by most of the Managers, as it would have been most abnormal for the Board to reject a report presented by its Secretary. The reply survives of one of the Managers, the barrister and cultured man of

(1) Ibid., pp.6, 12.
(2) Ibid., p.8.
(3) Ibid., p.9. Bence Jones himself provided the evidence to counter his claim of high Government salaries, by listing the principal scientific posts and their salaries (ibid., pp.6-7).
(4) Ibid., p.8.
(5) The reply also survives of George Dodd (see Appendix I.i), who approved the Report (Dodd to Bence Jones, 18 Feb 1862, Box XVII. 200).

letters, W.F. Pollock. In general Pollock agreed with Bence Jones' argument that more money was essential to provide a secure foundation for research at the Institution. But Pollock's view of the R.I. was rather different. His comment, "(You) have spoken of it as entirely or chiefly a place of scientific research - Well, so it is",(1) could hardly be described as a wholehearted endorsement of Bence Jones' view of the R.I. as a research institution. More important, Pollock went on to argue that Bence Jones had "not given sufficient prominence to the literary and social character of the R.I.", and that "there are many members who have joined it for the advantages of the Library, Weekly meetings and reading rooms".(2) He strongly advised that it would be "impolitic, to say the least" in anything intended for the general body of the Members, to ignore the literary and social aspects of the Institution.(3) To men like Pollock, friend though he was of Tyndall and many other scientists, an emphasis on research risked demoting to a poor second place those activities in which the Members participated. For moreover, those facilities which served the cause of the diffusion of useful knowledge, also contributed to making the R.I. a pleasant meeting place, a species of club providing for the cultivation of superior and learned interests. To ignore these features was to court financial disaster, for the finance essential to the continued support of research came from membership subscriptions, which contributed on average three-quarters of the R.I.'s total annual income. Bence Jones was wise enough to realise the importance of catering for the Members' interests, as changes in the emphasis of the lecture programme showed,(4) and this may also explain why he included in his Report a long extract from a lecture given in 1810 by Sir Humphrey Davy

(1) Pollock to Bence Jones, 19 Feb 1862 (Box XVII.200).
(2) Ibid.
(3) Ibid.
(4) See below, pp.203-6.

on the beneficial influence and encouragement that women can give to science, by endeavouring "to awaken and keep alive a love of improvement and instruction", a passage that reads oddly against the rest of the Report, and moreover in no way answers Pollock's criticisms.(1)

Bence Jones' desire to establish the R.I. as a permanent and secure centre for scientific research was undeterred by any criticisms, and this new emphasis on research as the primary objective was underlined shortly afterwards by a change in the official R.I. 'Prospectus' in 1863. The four objectives listed earlier as set out in 1852 remained the same, and the broad wording of "Scientific and Literary Research" was retained.(2) But the order in which the Institution's subsidiary facilities were listed was altered, and "A LABORATORY" firmly replaced "PUBLIC LECTURES" at the top of the list.(3) Furthermore, at the end of this year, 1863, the layout of the 'Prospectus' was changed, and the space devoted to work done in the laboratory was substantially increased.(4)

Immediately following Bence Jones' Report, plans for expansion went rapidly ahead. In July 1862, a new Professor of Chemistry was nominated in the person of Edward Frankland (1825-1899).(5) Frankland was a chemist of some reputation and played an important part at the R.I. in this vital decade. A close friend of Tyndall since their days together teaching at Queenwood, Frankland had been professor of chemistry from 1851 to 1857 at Owens College, Manchester, before his removal to London as lecturer in chemistry at St. Bartholomew's Hospital, a post obtained through Bence Jones' influence with Sir James Paget, one of the surgeons

(1) Bence Jones, Report, pp.12-13.
(2) See above, p. 150.
(3) 'Prospectus' (1863), pp.vi, vii (Annual Report 1862, 'Membership Lists' (1860-64)).
(4) Guard Book, iii. item 93. This new 'Prospectus' was the first to be so termed, and was dated December 1863. From that year onwards, the 'Prospectus' appears to have been issued in November or December of each year, updated by listing the Managers and Visitors for that year, and any new scientific discoveries made in the laboratory.
(5) Man.Min., XI.444-5 (7 July 1862). See D.N.B. for details of Frankland's life and scientific work.

there.[1] His appointment to the R.I. was almost certainly due again to the influence of Bence Jones, together with Faraday and Tyndall's warm support. Although Frankland did not officially take up his appointment until April 1863, he gave two afternoon Courses of lectures at the R.I. between December 1862 and April 1863, which were well paid and ensured his constant presence in the Institution from the beginning of the year.[2] A modest laboratory was provided for him by removing the seats from the basement lecture theatre where Brande had formerly given his lectures to medical students.[3]

Furthermore, in November of the same year, 1863, both Tyndall and Frankland were given laboratory assistants for the first time.[4] The following month, Tyndall was permitted to engage a second "trained assistant".[5] From this time there were never less than three laboratory assistants, where before there had only been the faithful Sergeant Anderson, Faraday's sole assistant, and the Managers' Minutes during this decade are full of the assistants' comings and going, promotions and rises in salary. Frankland also had one colleague working with him, and at one period a "Non-Salaried Assistant in the Laboratory" as well.[6] Apparatus required was provided and that recurring distraction, the lectures, reduced as far as possible. In 1867 Frankland's Course

(1) Sketches from the Life of Edward Frankland (1902), p.135.
(2) There is no reason given for the delay between Frankland's nomination in July 1862 and election in April 1863, but probably the time needed for alterations to the laboratory and the Managers' ever-present reluctance to increase expenditure, may account for the delay. Frankland gave the Juvenile Lectures in Dec 1862 – Jan 1863, and a Course "On Chemical Affinity" in the early months of 1863. He was paid 50 gns. and 45 gns. for these lectures, which amounted to the equivalent of half his year's salary at the R.I. (Man.Min., XI.462 (2 Feb 1862), XII.4 (6 Apr 1863)).
(3) Ibid., XI.447-8 (3 Nov 1862).
(4) Ibid., XII.32 (21 Nov 1863).
(5) Ibid., XII.36 (7 Dec 1863).
(6) Frankland's colleague was B.F. Duppa (1828-1873). He was a well-to-do chemist, with his own private laboratory, who became an F.R.S. in 1867 (Proceedings of the Royal Society of London, xxi (1873), 6-9). A Mr. Tingle was engaged on Frankland's recommendation as unpaid assistant (Man.Min., XII.89 (6 Feb 1865)).

of lectures was cut from twelve to six, expressly in order to give him the maximum amount of time possible for research, and by 1870 Tyndall's Course too had been further reduced.(1) The contrast could not have been more marked to that period several years earlier when Brodie had been refused the services of a single laboratory assistant. The emphasis was now on satisfying the Professors' every need, and the laboratories ceased to be the home of the single devotee and became busy places providing the nucleus of a research school.(2)

All this naturally meant a considerable increase in expenditure, on salaries for Frankland and the laboratory assistants and extra costs on chemicals and apparatus.(3) The Managers announced their intention of altering certain Bye-laws in order to apply additional funds for the support of research, with a fine declaration:

> That considering the relation of Science to mankind and the progress of research and discovery in the Royal Institution during a long series of years, it is, in the opinion of this Committee, a fit, important and highly worthy object of the Members of this body to appropriate Funds for the development of original research in their Laboratories under their present Professors. (4)

Bence Jones too once more addressed the Members. His <u>Letter to the Members of the R.I. on the Future Encouragement of Scientific Research</u> (1863) echoed his <u>Report</u> of the previous year, stressing once again the vital importance of research to the continuation of the Institution,

(1) Man.Min., XII.174 (4 Feb 1867). Furthermore, in July of that year it appears from a note in the Minutes that H.E. Roscoe, Professor of Chemistry at Owens College, would give Frankland's lectures (<u>ibid</u>., XII.203 (1 July 1867)). From 1870 Tyndall's Course of lectures varied between six and nine, instead of the normal twelve in the 1860s ('Index to Lectures' (1841-1912)).
(2) There is one entry in the Managers' Minutes which appears to suggest that Frankland had students at the R.I.: "<u>Resolved</u>, That Dr. Frankland be authorized to adjust the supply of steam and water at the working tables of the Laboratory, and that sufficient evaporating and condensing power be obtained at each student's place" (Man.Min., XII.24 (6 July 1863). Frankland does not mention students in his <u>Sketches</u>, and there is no other information at present that elucidates this statement.
(3) Frankland and the laboratory assistants' salaries amounted to £375 in 1864, the first full year. This figure increased with rises in pay from time to time.
(4) Man.Min., XII.31 (21 Nov 1863).

and the pressing need for money to pay for apparatus and the salaries of the lab assistants.(1) Contributions were invited to a Donation Fund, an idea which had been suggested by the donation each year of £40 for the purchase of apparatus by Sir Henry Holland, the future President of the R.I.(2) Bence Jones' aims were however more ambitious than merely provision for immediate needs; he wished to see professorships endowed with permanent incomes, to settle annuities on retired professors, to have a permanent fund for the promotion of scientific research, and to rebuild the laboratories.(3) Had he achieved all these aims, the "university of research" would have become a reality, but only in the last, the rebuilding of the laboratories, was he successful.

The Donation Fund was closed in 1872.(4) By that time indeed the R.I. felt prosperous enough to spend an estimated £4,000 on new laboratories (a sum which increased to £6,000 by their completion). During the ten years of the Donation Fund's existence, it provided money for apparatus and the salaries of the laboratory assistants, but no more. It was treated as income, not as capital as Bence Jones had hoped. It failed to provide the funds for Bence Jones' longer term objectives, and it failed to attract widespread support from the R.I.'s Members. An analysis of the contributions shows that 80.8% of the total was given by men who were Managers or Visitors. Members contributed only 13.7%, and the R.I.'s Professors 5.5%, revealing the unhappy situation of an ill-paid professor contributing to a Donation Fund for his own

(1) The Honorary Secretary, <u>A Letter to the Members of the Royal Institution on the Future Encouragement of Scientific Research</u> (privately printed, R.I., 1863), 8 pp., Guard Book, iii. (item 97) (hereafter cited as Bence Jones, <u>Letter</u>).

(2) Holland made his first annual donation of £40 in 1859, and continued to do so until his death in 1873 (Sir Henry Holland to the Secretary, 4 Apr 1859, entered in Man.Min., XI.273-4 (4 Apr 1859)).

(3) Bence Jones, <u>Letter</u>, pp.6, 8.

(4) Man.Min., XII.358 (5 Feb 1872). A list of donations continued to be printed and included in the Visitors' Annual Report even after the Fund had been officially closed. When a new fund-raising drive was started in the 1880s, donations were added to the old list containing details of all donations and legacies since 1863.

apparatus.[1] It proved impossible to persuade a large enough number of different people to contribute. The largest number of people who contributed in any one year was twenty-six in 1864; by 1866 only six new names figured among contributors; and by 1871 the entire list of donors for that year consisted of only three names.[2] For all Bence Jones' efforts, and for all his substantial achievements, he could not persaude the Members of the R.I. to support research in any way beyond their annual membership subscriptions.

Nevertheless, Bence Jones did achieve the rebuilding of the laboratories, which had remained virtually unchanged in the basement for seventy years. With the aid of the only substantial legacy received since 1833, for £2,000, Bence Jones organised the rebuilding, which started in 1872 and was completed in 1873. By this time however his health was deteriorating fast and he was rarely able to go out to the R.I. When he saw the rebuilding, he was overwhelmed by the size and splendour of the new laboratories: "It is far too magnificent. However there it is."[3] Sadly in old age and illness, his vision briefly deserted him, though he remained as firm as ever in his "conviction of the value of original research, and of the special vocation of the R.I. to continue diligent in promoting it", as the Managers said when replying to his resignation as Secretary.[4] He resigned in March 1873, and died in the following month.

The period of Bence Jones' association with the R.I. was a crucial one. For twenty years he had been the most influential force in the

(1) Figures compiled from sums listed in "Donation Fund" 1863-72 (Visitors' Annual Report 1873, pp.xxxiii-v), excluding legacies. Faraday and Tyndall each made three donations, totalling £60 and £70 respectively.
(2) Ibid., p.xxxv.
(3) Bence Jones to Tyndall, 10 Dec 1872 (Tyndall, Correspondence 14/F10.55). Such expressions occur in several of Bence Jones' letters to Tyndall, who was in America at this time (see ibid., 14/F10.54-59).
(4) Man.Min., XII.441 (10 Mar 1873).

management, and for thirteen years the Institution's energetic Secretary. His drive ensured that no vacuum was left during the time of Faraday's decline and old age, and indeed the continuity of the period was undisturbed by Faraday's death in 1867. In the 1860s more was done than ever before to ensure that the R.I. should remain an institution for scientific research, and the decade proved to be a fruitful one in that respect. These years covered Tyndall's work on radiant heat, which formed one of his more significant contributions to scientific knowledge (with ten memoirs between 1859 and 1870), and Frankland's important work on the chemical synthesis of ethers and various organo-metallic compounds, as well as his investigation into the effects of pressure upon the luminosity of flames.(1) In 1870 Tyndall began his investigations into "Dust and Disease", where his work gave powerful support to Louis Pasteur's germ theory of disease, and played a large part in defeating the opposing theory of the spontaneous generation of life.(2) However, Bence Jones failed to solve the financial problems on any longer term basis, and moreover, the promise of the middle years of the decade that the R.I. might develop into a research school, a "university of research", with a permanent staff of several working professors was not fulfilled. This was certainly a possibility while Frankland remained at the R.I., despite the constraints of finance. But in 1867 Faraday died, and with Tyndall entrenched as Faraday's heir, there was little opportunity for

(1) See C.C. Gillispie (ed.), Dictionary of Scientific Biography (1970-), V.126. This reference work contains the most up-to-date assessment of the life and work of all the major scientists from ancient times to the present day, and will be subsequently cited as D.S.B.

(2) "Dust and Disease" was the title of Tyndall's Discourse in 1870 which first described his investigations into organic matter floating in the air, and its connection with the germ theory of disease (P.R.I., vi (1870-72), 1-14). For a discussion of Tyndall's part in the disputes surrounding this subject, see J. Friday, 'A Microscopic Incident in a Monumental Struggle: Huxley and Antibiosis in 1875', British Journal for the History of Science, vii (March 1974), 61-71.

Frankland to obtain the status and position appropriate to his talents, as the salary differential of one-third showed.(1) In 1868, five years after joining the R.I., Frankland resigned despite his regret at abandoning research as the first call on his time, in order to succeed Augustus Hofmann as Professor of Chemistry at the Royal School of Mines, a post that offered more scope in terms of a professional scientific career.(2) Bence Jones expressed great disappointment at Frankland's "removal to a position where teaching rather than original investigation is the chief object".(3) Bence Jones was by no means uninterested in education, but as far as the R.I. was concerned, his priorities were clear-cut.

After Frankland's departure in 1868 and Faraday's death the previous year, it was decided not to appoint two new professors of chemistry. Faraday had after all done no scientific work or lecturing since 1862. Tyndall took over the position of Superintendent of the House. Furthermore, it was decided that Faraday's successor as Fullerian Professor of Chemistry (whose endowed stipend of a meagre £100 was enlarged by a further £200 by combining with it the post of Director of the Chemical Laboratory) should be a three-year appointment only.(4) Tyndall therefore had no rival to his supremacy, and never more popular or widely known than in the early 1870s, made himself the indispensable attraction on which the Institution's reputation rested. He was an attractive, though increasingly touchy and combative individualist, and it should perhaps be

(1) In 1864 Tyndall's salary was £300, and Frankland's £200; in 1868 Tyndall's rose to £450 and Frankland's to £300, so there was no lessening of the differential.
(2) Frankland to Bence Jones, 9 Oct 1868 (Box XVII.211; also entered in Man.Min., XII.276-7 (2 Nov 1868)). Frankland also had an increasingly large family to support, which may have played some part in his decision to leave the R.I., unlike both Faraday and Tyndall, who had no children.
(3) Man.Min., XII.277 (2 Nov 1868).
(4) _Ibid_., XII.264 (22 June 1868). William Odling (1829-1921) was elected Fullerian Professor of Chemistry in June 1868, and following Frankland's resignation in November, Odling was appointed Director of the Chemical Laboratory (_ibid_., XII.283 (7 Dec 1868)). The two salaries came to the same amount, £300, that Frankland had received in 1868.

no surprise that in such circumstances a school of research never materialised. The attraction of the Institution to its Members too, despite all Bence Jones' admonitions, was not the work carried on in its laboratories, nor its reputation as a centre for scientific research, but rather the quite different and much more diffuse attractions of a literary and philosophical society.

Chapter 4

The Lecture Theatre - Education and the Diffusion of Useful Knowledge

The R.I. had always been an educational institution. In its Charter of 1800, "teaching by courses of philosophical lectures and experiments, the application of science to the common purposes of life" was second only to the diffusion of knowledge of new mechanical inventions and improvements. The transfer to the R.I. not long after in 1813 of Brande's laboratory lectures served above all to emphasize the teaching side of its activities. In the 1820s the ideas of the movement for the diffusion of useful knowledge permeated all its educational activities. Although the possibility of expanding formal instruction was finally rejected in the 1840s, as described in the preceding chapter, there was never any question of the Institution reducing its more general educative activities. These were and remained an integral part of the R.I. There was however in the period under discussion here some uncertainty as to what purposes they served, partly on account of the kind of institution that the R.I. had become by that time. Were such activities supposed to be educative in a serious sense, providing some type of formal instruction? Or were they simply, as Sir Llewellyn Woodward aptly termed it, the "organisation of leisure with indirect educational results"?(1) In short, was this simply one way in which people participated in scientific life and culture, and if so, who were the people in question (bearing in mind the well-known fashionable image of the R.I.), and what effect if any did they have on the development on the Institution? This chapter will be concerned to describe the R.I.'s activities in this sphere, to analyse the composition of the people involved in so far as that is possible, and to elucidate changes that occurred over the period and their consequent effect upon

(1) Sir Llewellyn Woodward, The Age of Reform 1815-1870 (2nd ed. 1962), p.495, n.2.

the future of the Institution.

The principal medium used by the Institution to serve the cause of education and the diffusion of useful knowledge was the lecture, of which several different types were to be found at the R.I. These have been largely ignored by historians of science, or examined solely in relation to the life of a particular scientist. Lectures were however more than merely a by-product of scientific work at the R.I., they were in themselves a distinct activity which played a vital part in fulfilling the Institution's objectives, and thus merit discussion at some length. The sheer amount of material surviving on this subject is one testimony to their importance, and because they were so very important and in order to pick up the threads of their history in the mid-century, it is appropriate first to say something about nineteenth century lectures in general.

In the first half of the nineteenth century the lecture became a favoured method of presenting a wide variety of knowledge to almost any sort of audience, so that the provision of abundant lectures is one of the outstanding developments in the means available for the communication of ideas in this period. It is however important to remember that until the middle of the century the great majority of lectures were given to comparatively humble people in provincial places. In general they were not considered appropriate for the upper-classes or London Society. Around the middle of the century this attitude changed, and, for example, due no doubt to the influence of the Prince Consort, men such as Richard Owen, the celebrated professor of comparative anatomy, or John Tyndall himself, were invited to give lectures before the royal family.[1] Furthermore, it was more usual in the earlier part of the century for lectures to be given outside the formal confines of an

(1) Richard Owen (1804-1892) lectured at Buckingham Palace to the royal children in April 1860 (Rev. R. Owen, The Life of Richard Owen (1894), ii.98-100), and Tyndall was invited to lecture at Osborne in January 1864 (R.I. Tyndall MSS, Journals of Thomas Archer Hirst, IV.1661, 1664 (20 Dec 1863, 31 Jan 1864); this source will be cited as Hirst Journal).

institution, in public or in church halls for example, in the way that public meetings or events were organised from time to time. The lectures at the R.I. which attracted so much fashionable attention in its early decades were distinctly unusual.

In the first half of the century lectures were not highly thought of as a means of instruction by the old-established universities, where teaching was based on the tutorial, and lectures were commonly regarded, as Mark Pattison later wrote, as "a joke or a bore, contemned by the more advanced, shirked by the backward".(1) By contrast, the Scottish universities, which had always followed the Continental model, and the new educational institutions of the mid-century, both regarded lectures as a sound method of serious instruction. At a lower level, there were numerous lectures given in mechanics' institutes and in the many varied philosophical societies, and their function was also seen as instructive, covering both the diffusion of useful and technological knowledge, and also to some extent the principles of pure science that underlay the mechanical and industrial applications of science. Many of these institutes and societies were served by itinerant lecturers, and science was one subject favoured by such men. Not until the middle of the century did these itinerant lecturers become tied to one institution.(2) Standards naturally were very varied, but in general, science lectures had a reputation for showing experiments which invariably failed ignominiously.(3) Nor should one forget another large group of lecturers whose quite different purpose was propaganda for some political campaign or social cause, such as the lecturers appointed by the Anti-Corn Law

(1) Mark Pattison, Memoirs (1885), p.53.
(2) A short note of the activities of such men in the Sheffield-Nottingham-Derby area may be found in I. Inkster, 'A Note on itinerant science lecturers, 1790-1850', Annals of Science, xxviii (April 1972), 235-6.
(3) As late as the 1870s experiments which succeeded and did not "break down with provoking perversity" as they so often did, called forth expressions of admiration, as in Becker, op.cit., p.51.

League or the temperance societies.[1] The medium of the lecture was therefore a flexible instrument used for imparting facts, or ideas, or opinions, at a period when the spoken word was still perhaps the most important and wide-reaching of the various means of communication. In the middle of the century however the role of the lecture changed. The printed word became far more important than before as a means of conveying information and ideas, with the enormous increase in publications of all types after 1855. At one end of the scale lectures became primarily a means for the instruction of the inmates of educational institutions, and at the other end, they became simply a form of entertainment. At the same time techniques were refined, a development particularly noticeable with regard to the sciences, where the conversational lecture-demonstration replete with many colourful experiments became the accepted pattern, in contrast to the older rhetorical form of lecture with its exordium, main subject matter and peroration, which relied on verbal impact rather than visual adornment for its success.[2]

The range of lectures was thus considerable, and their role and purpose changed during the course of the first half of the century. Since however, the medium of the lecture and the movement for the diffusion of useful knowledge were closely connected, it is necessary to make a further brief digression on this subject. The heart of the matter concerns what was thought to be "useful knowledge" and for whom it was intended. At one level it was intended primarily for literate artisans and mechanics with a practical knowledge of their craft, for those who attended the newly-founded mechanics institutes, and who purchased the penny pamphlets produced by Brougham's Society for the

(1) A.W. Paulton, mentioned above p.103, was one such lecturer for the Anti-Corn Law League (D.N.B.).
(2) See below, pp.213-7 for the increasing importance of the visual element, the demonstration, in the lecture.

Diffusion of Useful Knowledge. The knowledge provided for them was felt to be useful principally because it could be applied in their work. The sciences were therefore especially prominent and the type of science generally concerned technological knowledge although pure science was not excluded, since the aim of teaching the "sciences underlying the arts" meant in practice teaching a considerable amount of pure science.(1) How useful it really was is quite another question, but it was believed to be useful and ultimately productive. At a different level, the movement for the diffusion of useful knowledge was also concerned with the education of the "middling" ranks of society, with those people who would fill the lower ranks of the professions or work in commercial and industrial undertakings. For such people the liberal education of a gentleman was unnecessary and inappropriate, and it was a practical alternative that was envisaged in the foundation of the new colleges of London University with their heavy emphasis on the sciences.

Outside institutions where the educational purposes were more or less clearly defined, the diffusion of useful knowledge embraced a multiplicity of functions, which are best understood by enumerating the ways in which people regarded scientific knowledge as "natural truth, polite knowledge, technical agent, theological edification, social anodyne, and cultural affirmation".(2) These are by no means mutually exclusive categories, nor in the present study is it possible to exhaust the implications of each in the context of the R.I., but certain characteristics that are relevant here should be noted. What was often termed at the

(1) On this question, see Cardwell, op.cit., pp.43-44.
(2) J.B. Morrell, 'London Institutions and Lyell's Career: 1820-41', British Journal for the History of Science, (July 1976), 136. See also, A.W. Thrackray, 'Natural Knowledge in cultural context: the Manchester model', The American Historical Review, lxxix (1974), 672.709.

time "rational entertainment" could include scientific knowledge of all types, either pure science, but more often technological or applied science. The approach in general was explanatory or informative, dealing with technological developments or the explanation of scientific phenomena, without any expectation that such knowledge would be put into practice in either a manual or a professional sense. Subjects were presented in a way too that was considered to be both elevating and entertaining, although indeed the entertainment might appear to be of a very solid and rational kind. There was always a moral side to the question, since the process of acquiring knowledge was self-improving, and therefore of moral value to the person concerned, and furthermore, such knowledge was in itself a revelation of the beauties and complexities of the universe, and thus testimony to the all-pervading bounty and might of the Creator. In addition, this should be seen as a patriotic exercise, for it concerned all those things to be held up for admiration, all the exciting developments of a technological revolution - iron bridges, railways, new machines and devices of every description - which at the same time explained the agents by which a changing landscape was moulded, but perhaps more importantly, gave people a sense of participation in an historic movement, a sense of being part of those developments that visibly contributed to England's strength and greatness.

This was far from the aristocratic tradition of learning (an ideal that proved equally long-lived), and was a type of entertainment that appealed strongly to the middle-classes. There were a number of different facilities for the provision of such edifying entertainment. The most relevant in the present context are naturally the learned societies, as it would be an omission to exclude some mention of these as providing for rational entertainment, in addition to their main concern with the advancement of learning in their own particular field. Unspecialised institutions comparable to the R.I. provided lectures as one of their main functions, and these were, with few exceptions, of one type with one clearly recognisable objective. The 1851 Census shows that in other institutions lectures were normally given once a week, with the exception of proper academic establishments, of the London Institution and the Royal Polytechnic Institution (Cayley's public hall of popular science).(1) In contrast, at the R.I. there were no less than four different types of lecture presented concurrently (until 1853), and these were moreover provided on a scale unequalled elsewhere outside purely educational institutions. The R.I. may therefore be considered as the principal lecture theatre of the metropolis for those other than professed students.

Each of the four types of lecture presented at the R.I. was different in origin and function, and three of these will be analysed here: the afternoon Courses of public lectures, the Friday Evening Discourses and the Christmas holiday Juvenile lectures. The vicissitudes of the fourth type of lecture, the morning laboratory lectures for medical students, have already been narrated in the preceding chapter, and they will therefore be discussed here only when their function also concerned those of the other three types of lecture.

The afternoon Courses of lectures were first given in 1800 and were thus the oldest type of lecture given at the R.I.(2) They were given in the main lecture theatre (as were all the lectures except the laboratory lectures) at 3.00 p.m. on Tuesdays, Thursdays and Saturdays during the season, from January to June. They totalled around sixty lectures each year, divided into "Courses" varying in length between six and twelve lectures each in the 1840s, but considerably shorter in later years.(3)

(1) Census of Great Britain 1851, Education: pp.215-17.
(2) The afternoon Courses were also termed "theatre lectures" or "public lectures", but these terms have been avoided for the sake of clarity.
(3) See below, pp.204-5.

The Professors of the R.I. gave three of the total number of Courses, if the Fullerian Professor of Physiology's Course is included. For the remaining Courses, men from outside were engaged and paid an average of 5 gns. per lecture, even on occasion a larger amount in later years, and these were princely fees by the standards of the time. These afternoon Courses were free to all Members of the Institution, and open to the general public on payment of a subscription. The subscription was of two kinds: people could either purchase a general subscription for 2 gns. to all Courses of lectures presented that season, or for 1 gn. could purchase a subscription for a single Course. The wives of Members, and their sons and daughters under the age of twenty-one, were permitted to purchase tickets at half-price.

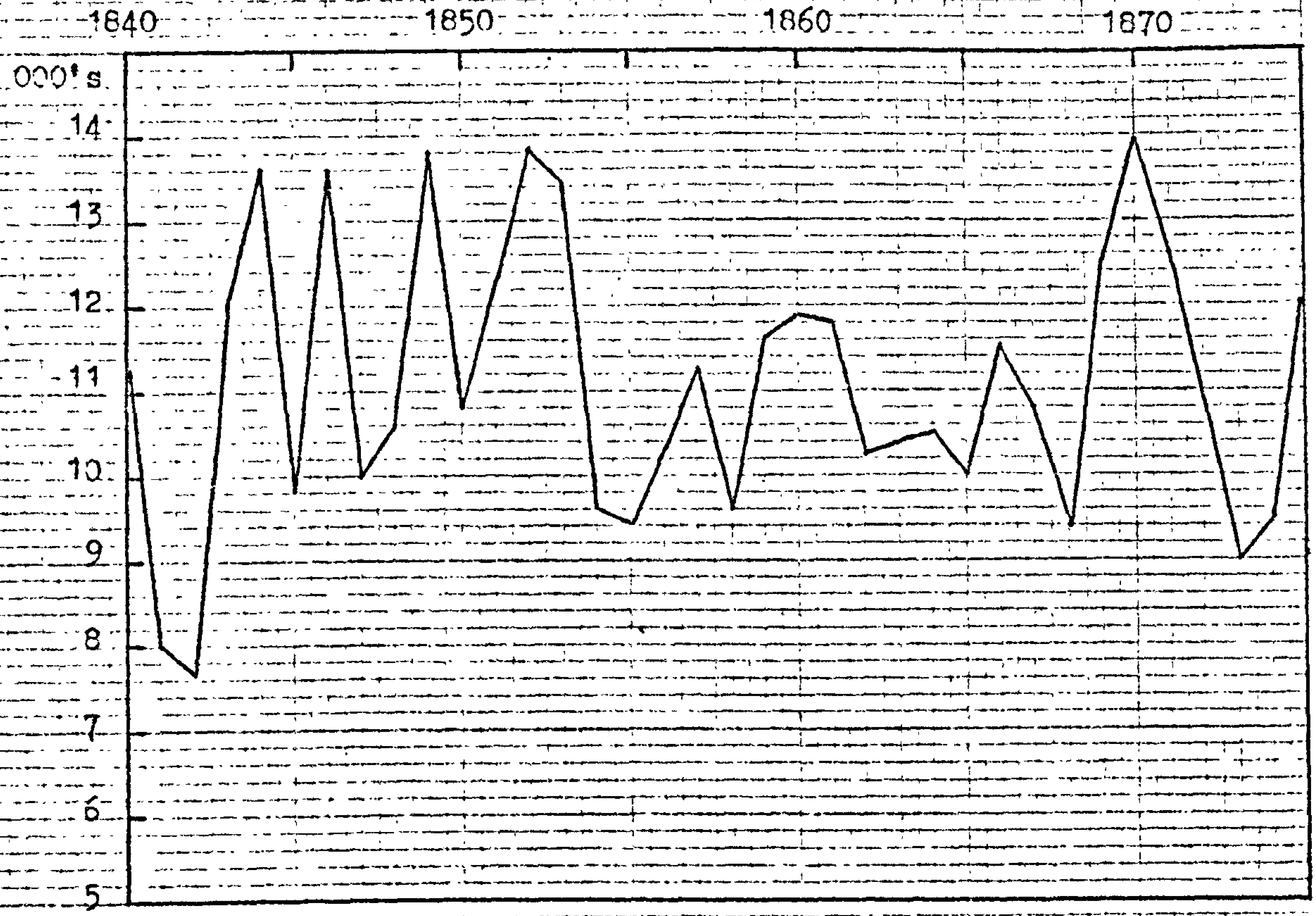
Attendance at Courses naturally varied enormously, but on average the numbers in the theatre (which could hold 700) were between 150 and 200 at each lecture, and although on occasion the audience was much larger, it is fair to say that any figure below 150 could be considered a poor attendance. Looking at the whole picture, total attendance at Courses varied erratically from year to year, although it remained somewhat steadier from 1854 to the end of the 1860s (see Graph 3). Any general increase in attendance may be largely accounted for by an increase in the number of tickets purchased for one or two especially popular Courses. Nonetheless, there was a consistent number of general subscriptions purchased over the period, suggesting that there was little noticeable increase in discrimination in lecture-going on the part of the public (see Graph 4).

From 1848 it is possible to find out in more detail who composed this audience, when ledgers began to be kept giving the date and name of each person who purchased a ticket for the afternoon Courses of lectures, although it is inevitably impossible to tell which particular Courses were attended by people who had purchased a general subscription.

Graph 3.

Attendance at afternoon Courses of Lectures 1840-1875

Source: 'Index to Lectures' 1829-1841, 1841-1912.



Notes: 1. The peaks in the 1840s were generally due to the provision of an extra Course. In 1841 and 1842 Faraday gave no Courses of lectures; he gave his final Course in 1853.

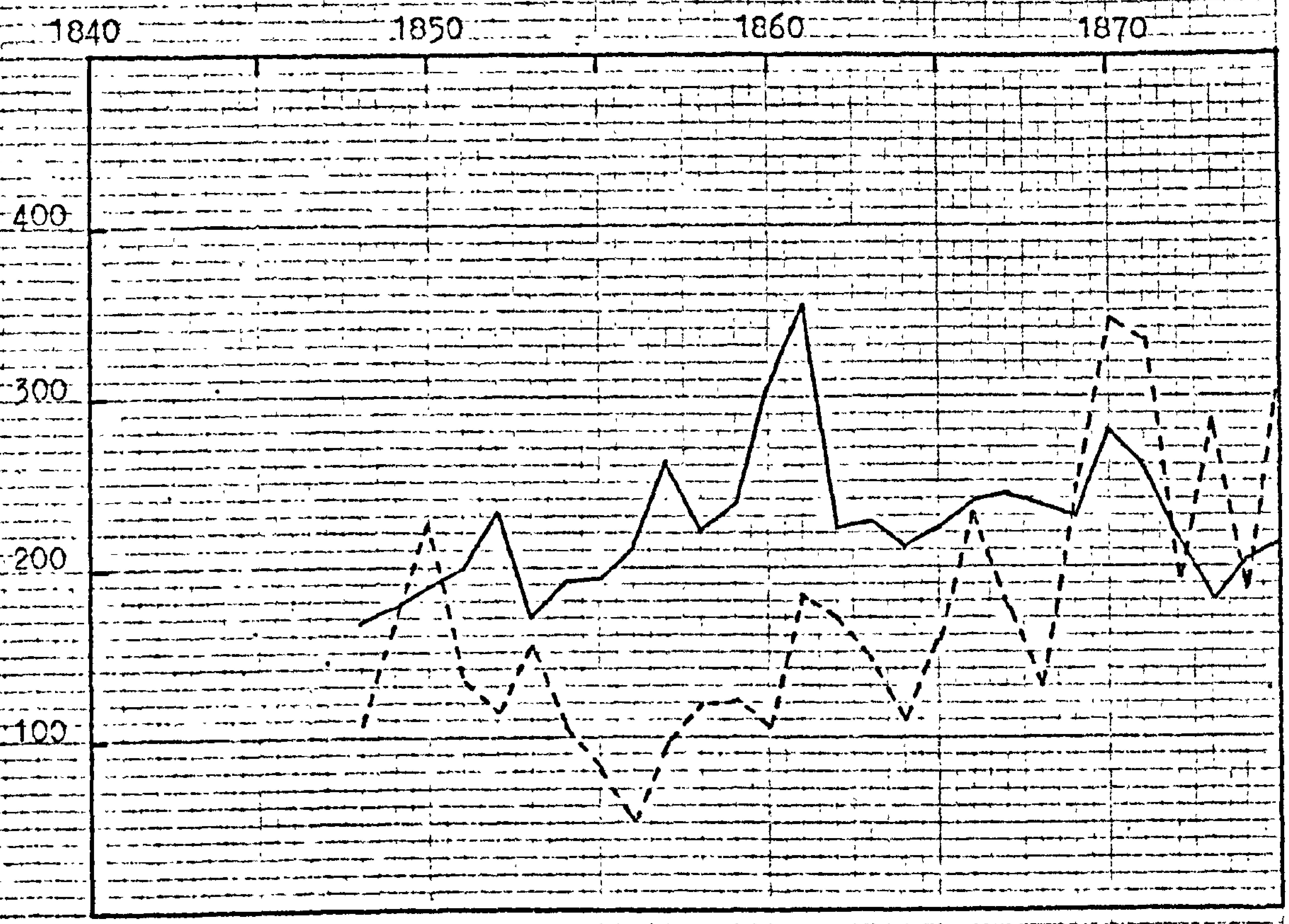
2. The 1870 peak was due to extremely popular Courses given by Tyndall, Max-Müller and Norman Lockyer.

3. The 1875 peak is accounted for by increased attendance at Tyndall's Course (the year following his notorious Belfast Address to the British Association), which accounted for a third of the total.

Graph 4.

Subscribers to Afternoon Courses of Lectures 1847-1875

Source: 'Subscribers to Lectures', i-iii, 1847-75.



——— General Subscriptions

- - - Single Course Subscriptions.

Furthermore, many R.I. Members also attended lectures and no record of their names survives other than the occasional reference in contemporary memoirs. An examination however of the ledgers of 'Subscribers to Lectures' does reveal certain interesting pointers. Firstly, the number of women who purchased a general subscription to all Courses of lectures outnumbered men by two to one, and the proportion of women in the 1860s and 1870s was even higher than the already high figure of the early 1850s. The same pattern may be seen among those who purchased a ticket for a single Course only, although the numbers here varied erratically (see Table 6). Only when the subject of the Course was both specialised and of professional interest, did tickets purchased by men outnumber those bought by women. In 1855, for example, the majority of the tickets for Emil du Bois-Reymond's Course on Electro-Physiology were purchased by men, of whom half were doctors.(1) Otherwise, purchasers of subscriptions were always predominantly female.

Table 6 Subscriptions to Lectures(2)

General Subscriptions	1850	1851	1852	1860 %	1861	1862	1870 %	1871	1872
Men	43.3	33.3	35.4	28.5	24.4	28.7	35.0	28.5	30.9
Women	55.0	64.6	62.3	71.5	75.2	71.3	65.0	71.5	69.1
Single Course Subscriptions				%			%		
Men	31.6	42.5	29.5	30.7	42.4	32.5	44.6	28.0	37.0
Women	68.4	57.7	70.1	68.2	57.6	67.5	55.4	72.0	63.0

Secondly, the great majority of those who purchased tickets were personally undistinguished. There were relatively few titled names,

(1) R.I. MSS, 'Subscribers to Lectures', i.215.
(2) Where the two sets of figures do not add up to 100%, this is accounted for by a small number of boys, designated "master" in the ledgers, who have not been included with 'men'. It appears to have been general at the R.I. to call boys under the age of sixteen "master", and those over the age of sixteen "esquire", and this seems to have been the practice too with Members' sons.

especially among those who purchased general subscriptions. In the earlier part of the period for which evidence is available, namely the late 1840s and early 1850s, there were very few titled names at all, except among those who bought tickets for Faraday's Courses, where in contrast to the general trend, there was always a liberal sprinkling of aristocratic names. In later years, Courses by Tyndall, or by a few other extremely well-known figures, did attract some titled support, but generally speaking otherwise the overwhelming majority of tickets were bought by people who were of middle or upper-middle class background. It is true that the evidence of these particular records is not conclusive, for from 1849 Members could purchase packets of three tickets, each of which gave admission to a single lecture. These packets were generally purchased by Managers or the officers of the Institution, who evidently distributed the tickets freely, particularly Spottiswoode, who in 1870 purchased as many as fifty-three of these packets.(1) Indeed, distinguished people probably had only to mention their interest to a Manager for a ticket to be immediately forthcoming. Moreover, where titled names do appear, more often than not they were those of women, and in the latter part of the period these were frequently women of very individual stamp, such as Lady Salisbury, wife of the future Prime Minister, Lady Ashburton, widow of the politician and educationist, or the Dowager Lady Stanley of Alderley.(2) Such women were notable more for their intellectual interests and strength of character than as typical representatives of the landed aristocracy.

Thirdly, going to Courses of lectures at the R.I. was always, and continued to be, a family affair. Many of the tickets were purchased by

(1) 'Subscribers to Lectures', iii.112-14, 119-20.
(2) 'Subscribers to Lectures', iii.127, 138, 178. A portrait of Lady Salisbury may be found in Kenneth Rose, The Later Cecils (1975), passim; and of Lady Stanley in B. & J. Russell (eds.), The Amberley Papers (1937), 2 vols., passim. Lady Ashburton's frequent letters to Tyndall give an idea of her interests and social circle (Tyndall, Correspondence 5/F5-9).

wives of Members, or by a mother and daughter. It is not uncommon to find a succession of people identified as the following group were in 1861, "wife, sister, sister, Aunt, Cousin, Friend, Daur".(1) It is probable too that many of the daughters were young. Unmarried women accounted for between 30% and 40% of the total number of those who bought a general subscription, and in some years, an even higher proportion of those who purchased single Course subscriptions.(2) Many no doubt were middle-aged spinsters, but one may be certain that some were under the age of twenty-one, as daughters under twenty-one of R.I. Members paid only half the normal price for their tickets, and by 1870 they accounted for an increased proportion of the total number of general subscriptions (see Table 7).

Table 7 General Subscriptions to Lectures(3)

	1850	1851	1852	1860	1861	1862	1870	1871	1872
Total subs	187	198	231	305	352	223	280	260	217
Unmarried women	75	77	84	120	101	93	97	85	74
R.I.Members' daughters	24	26	26	36	23	23	40	37	38
R.I.Members' sons	9	6	11	5	8	3	10	7	8
Boys under 16	3	4	5	-	1	-	-	-	-

By contrast there were relatively few boys and young men. In short, the overriding impression remains that those who bought tickets for afternoon Courses of lectures at the R.I. were predominantly female and middle-class, with probably a substantial number of young people among them.

The main function of the Courses of lectures may be briefly outlined

(1) 'Subscribers to Lectures', ii.116.
(2) In 1860, for example, 39.3% of the general subscribers, and 45.1% of the single Course subscribers were unmarried women (ibid., ii.80-100).
(3) The number of unmarried women may be marginally higher, as it is not always possible to tell whether a peer's daughter was married or not.

as general education and elementary instruction in the sciences. The subjects of the Courses included, as a 'Prospectus' of the period stated, subjects such as "Mechanics, Chemistry, Heat, Light, Electricity, Astronomy, Geology, Botany, and Physiology".(1) There were also some non-scientific subjects, especially from the 1860s, which will be discussed in more detail in the following chapter. The obligation to provide what was considered to be "sound instruction" continued throughout the 1850s, a fact which may be attributed in large part to the position that the R.I. had held in former years as a "school of chemistry", in the absence of formal educational institutions designed for that purpose. In the 1820s it appears indeed that the afternoon Courses of lectures and the morning laboratory lectures were very much part of the same intention, to provide instruction in the sciences. For instance, in 1827 Faraday gave a Course of twelve lectures "On the philosophy and practice of chemical manipulation", which were technical and intended for students, but hardly for a mixed audience of amateurs.(2) By the 1840s the similarities between the laboratory and afternoon Courses of lectures had disappeared, and they had become two quite different species of lecture. Nevertheless, an obligation to teach was still maintained as firmly as ever in the mid-nineteenth century. After listing scientific research, the 1851 'Prospectus' stated unequivocably the next two objectives in terms which remained unchanged for the rest of the century:

> II. To teach the principles of Inductive and Experimental Science;
>
> III. To exhibit the Application of these Principles to the various Arts of Life. (3)

The 'Prospectus' however gives an indication of what the R.I. recognised

(1) 'Prospectus' (1863), p.vii. (Annual Report 1862,'Membership Lists' (1860-64)).
(2) These lectures formed the basis of Faraday's only scientific textbook, Chemical Manipulation (1827).
(3) 'Prospectus' (1851), p.iii (Annual Report 1850,'Membership Lists' 1851-54)).

was really its chief contribution:

> These Lectures are intended to supply that which Books or Private Instruction can rarely afford - Experimental exhibition, highly illustrated delineations, or detailed descriptions of matters connected with science or art. (1)

In other words, the R.I. provided something additional to formal instruction, in the shape of the icing on the cake, the experimental exhibition or the "highly illustrated delineations". The requirement to teach continued to dog the Managers with what seems to be some sense of embarrassment throughout the 1850s, indicating their reluctance to accept the _fait accompli_ that the R.I. was no longer one of the recognised establishments of scientific education. There were periodic references at the R.I. to the difficulties of teaching as opposed to providing merely popular lectures. Faraday for one felt the two were incompatible, as he wrote to Barlow in 1846: "Lectures which _really teach_ will never be popular; lectures which are popular will never really teach".(2) The most that he conceded was that "respectable and sound" lectures could inform the mind and show "the attentive man what he really had to learn".(3) Furthermore the occasional presence of people who were seeking instruction must have contributed to the persistent feeling that the R.I. did have an obligation to teach. After all the youthful section of the audience should be instructed as well as entertained. The wives and offspring, especially if girls, of scientists who were prominent in the management, frequently attended Courses of lectures, obtaining there the sort of knowledge they would be extremely unlikely to find in their normal curriculum of education.(4) One might equally speculate that it was a harmless gesture

(1) _Ibid._, p.iii.
(2) Bence Jones, _Faraday_, ii.222-3.
(3) _Ibid._, ii.223.
(4) Purchasers of general subscriptions in the years 1868 to 1870 included the wives and/or offspring of C. Wheatstone, George Busk, Charles Brooke, J.H. Gladstone, Francis Galton, W. Bowman, among others ('Subscribers to Lectures', iii.44-9, 72-6, 104-6).

to make to the cause of women's education, a point considered perhaps more seriously by Anna Swanwick, the future founder of Girton College, who purchased tickets for single Courses on several occasions in the 1850s.(1) Moreover, at Tyndall's Courses there does appear to have been a genuinely studious element, for as he said, he endeavoured "to make the lectures really instructive", and his comment that "There are many hard workers in the audience",(2) is borne out by the names of young men such as Alexander Herschel, the future astronomer and physicist, who was then about to commence his studies at the Royal School of Mines, or of officers from the Royal Engineers at Chatham.(3) Elizabeth Garrett Anderson, the first woman to qualify and practise as a doctor, attended Tyndall's Course of twelve lectures "On Heat" in 1862, in order to enliven her solitary studies.(4) The total number of such people was however probably small, as such names do not occur frequently.

A further function of the Courses of lectures was to provide a small but welcome source of income. The lectures were after all an obligatory activity which involved some expense for an Institution with no spare financial resources. On average the cost of giving all the Courses (lecturers' fees, advertising, apparatus and sundries) came to around £400 p.a., being slightly lower some years in the 1840s, and nearer £500 p.a. in the 1860s.(5) It was essential not to make a loss, and if possible to endeavour to turn a profit, for such activities were the only way left open to the R.I. to make any money, since the laboratory had long ceased to provide any income. Income from the afternoon Courses contributed between 10% and 15% of gross receipts throughout the period.

(1) Ibid., i.104, 132.
(2) Tyndall, Journal VIIIa, p.185 (21 Jan 1860).
(3) 'Subscribers to Lectures', ii.95, iii.122-3.
(4) Her name does not appear in the ledgers, as she was given a ticket by Dr. John Chapman, proprietor of the Westminster Review (Jo Manton, Elizabeth Garrett Anderson (1965), p.119).
(5) Figures for each year are given in the 'Statement of Account' together with the Visitors' Annual Report.

The net profit after deducting all expenses relating to the lectures, tended to vary widely, often showing little relationship to the total number of people attending. For example, in the two years 1860 and 1861, total attendance at lectures was virtually the same (see Graph 3), and the gross income from tickets purchased was also almost identical; yet the net profit in 1861 was over £400 less than in the preceding year.(1) As early as 1843 the Visitors carefully pointed out that this account should show a reasonable return:

> But as the Visitors deemed it right ... to express how desirable it was, that in a literary and scientific society like the Royal Institution, the Lectures should be made not only popular, but to a certain extent a source of profit also, - it affords the Visitors real gratification to have to report this year the completion of those wishes.(2)

From this time onwards, the profit on this item was always mentioned in the Visitors' Annual Report, the Managers and lecturers congratulated every time the profit increased, and great concern shown if a loss was incurred.

The second type of lecture given at the R.I. was the well-known Friday Evening Discourse, presented at 9.00 o'clock on each Friday during the season, numbering in general twenty occasions. Only Members of the R.I. and their invited guests (two per Member) were admitted. The audience was therefore composed chiefly of Members and their wives, together with such guests as they cared to invite.(3) Attendance naturally varied enormously, but from 1850 there was a noticeable increase, and it became unusual after that time for there to be more than a few instances each season when the audience numbered less than

(1) In 1860 gross income totalled £908.7.0., and in 1861 £923.9.6. The net profit in 1860 amounted to a healthy £542.15.3., the highest achieved up to that time, but dropped sharply the following year to £114.8.11. ('Statement of Accounts', Annual Report, 1860 and 1861).
(2) Annual Report, 1843.
(3) See also, below pp. 229-36.

400 people. From the later 1850s the theatre was on some occasions more than filled to capacity, as the records show that as many as 1,000 people crowded to get inside.[1]

The Friday Evening Meetings were initiated by Faraday in 1826. He originally intended them to be informal soiree-conversaziones for the Members, but the Friday Evenings quickly became transformed into social occasions in their own right, providing the principal opportunity for Members to participate in the activities of the Institution, an aspect that will be referred to again in the following chapter. The lecture or Discourse itself was however the central feature of the evening, and presented many similarities to the afternoon Courses in style and content. In origin however its purpose was primarily to attract people to join the Institution rather than to provide instruction, or, as Faraday's notes on the earliest Discourses in 1826 put it: "to facilitate our object of attracting the world, and making ourselves with science attractive to it".[2] The area selected was naturally at that period useful knowledge. With his customary perception, Faraday's notes pinpointed the two elements which had to be combined to ensure success - amusement and utility. As well as being useful and instructive, the evening Discourse could be made interesting and amusing. In that way it would be possible even to deal with "scientific research - abstract reasoning, but in a popular way" as well as "to connect parts of science and facts generally separated and sometimes neglected in scientific arrangement",[3] in other words, to bring the theory and practice together in the manner of the best utilitarian principles.

The objective of the Discourses remained virtually unchanged into the middle of the century, when the first revised prospectus issued in

(1) For the speakers and subjects on these occasions, see pp. 212, 259.
(2) Bence Jones, <u>Faraday</u>, i.351.
(3) <u>Ibid</u>., i.351.

1851 outlined its aims:

> to afford opportunities of communicating, by Discourses in the Theatre, either new views or new applications of known truths, and of demonstrating by experiment, and familiarizing by description, new results which have been recently recorded in the Scientific Memoirs of Philosophical Societies. (1)

The purpose was indeed to aid in the diffusion of knowledge, but one may further define the knowledge involved as one of three types: it could be a research report, "new views", which might concern pure science; or it could concern "new applications", the developments and progress of applied science; or it might concern the "familiarizing by description" of new scientific work, which was surely a euphemism for popularisation as we understand it today, but which was then a term hated by the R.I., which always tried to remain aloof from the merely popular, with its supposed tendency to sacrifice scientific truth to mere display. Since the R.I. itself placed great emphasis on display, and since it was beginning to be necessary to popularise science as it became ever more complex, there was clearly a difficult balance to maintain, and accusations of pandering to the popular could not be avoided as time went on.

Faraday however had established a successful pattern. He himself gave normally four Discourses each season until the 1850s, when the number was reduced to two. At least one-third of his Discourses were on subjects of applied science; one can choose at random such varied topics as "On the Principles and Practice of Hullmandel's Lithotint" (1842), "On Recent improvements in the manufacture and silvering of mirrors" (1844), "On Anastatic Printing" (1845), "On Mr. Barry's mode of ventilating the new House of Lords" (1847), "On Envelope Machinery" (1849).(2) Faraday's other Discourses described either his own researches, or the scientific work of other people which happened to be of interest

(1) 'Prospectus' (1851), p.iv. (Annual Report 1850, in 'Membership Lists' (1851-54).
(2) 'Index to Lectures' (1842-1865), pp.5, 17, 22, 31, 41. Lists of Courses and Discourses presented each season were not printed and included in the Annual Report until 1849.

at that moment.[1] Until the 1850s he dominated the programme, and Brande for example never gave more than one Discourse each season. When Tyndall was appointed to the R.I., he gave two Discourses each year, and from 1853 shared equally with Faraday the burden of giving a fifth of the total number every year. Faraday himself was never more popular than in the last two decades of his life at the R.I. The lecture theatre was crowded on the Friday evenings when he gave the Discourse, giving visible and comforting evidence to the management of the continuing popularity of the Institution.[2]

Finally, there was the third type of lecture, that "adapted to a juvenile auditory".[3] This was a single Course of six lectures given during the Christmas holidays. It was open to the public on payment of a subscription of 1 gn. for adults and 10/6d. for children under the age of sixteen. Wives and children of R.I. Members were admitted at the juvenile rate. The exact details of the origin of these lectures are obscure and it is therefore necessary to discuss them more fully. The Juvenile lectures are generally supposed to have been started in 1826 by Faraday, ~~and~~ but although the idea may well have originated from him, he did not himself give either of the two earliest series. The first Juvenile course was given by John Wallis, a well-known itinerant London science lecturer, in December 1826-January 1827.[4] The subject was astronomy. The second Juvenile course was on natural history and given by Dr. Harwood. No mention of this course is made in the R.I. Record, which lists all Juvenile courses up to the present time, and its existence appears to have been previously unknown. But examination of an

(1) Examples were Faraday's Discourses "On MM.Boussingault, Fremy, Becquerel and other on Oxygen" (1853), "On Ruhmkorff's Induction Apparatus" (1855), and "On Schönbein's Ozone and Antozone" (1859).
(2) Between 1850 and his last Discourse in 1862, Faraday's audience generally numbered between 700 and 900 people ('Index to Lectures' (1842-1865), *passim*).
(3) The phrase was used from their inception.
(4) 'Subscribers to Separate Courses of Lectures and to Juvenile Lectures', 1826-1835, p.(1). This volume is unpaginated.

early volume of 'Subscribers to Lectures' reveals its existence, and furthermore that, unlike the other Juvenile Lectures, this particular series was given in April.(1) It was not well attended, which probably explains why Easter holiday Juvenile Lectures, if they were intended to be a regular event, were not repeated.(2) The third series, given by Faraday in December 1827–January 1828 was more successful, benefiting no doubt from the popularity generated by his Friday Evening Discourses. The R.I. itself remained uncommitted until the success of the Lectures was proved. The lecturer was not paid direct, but received instead two-thirds of the money paid in subscriptions, which was after all a common method of payment at that time, and applied in the case of the laboratory lectures. After 1829 the method of payment appears to have been changed, and the lecturers began to be paid a specific amount.(3) The R.I. was then financially committed to the Juvenile Lectures and to their success.

The date when these Lectures were first given coincides so closely with the foundation in 1826 of University College, London, an institution concerned to promote the education of much the same age-group as that which came to the Juvenile Lectures, that this may not be without significance. Faraday himself had links with some of the founders and early professors. Indeed, in October 1827 he was offered the chair of Chemistry at University College, but refused on account of his anxiety to see the R.I. prosper and because of obligations to continue his investigations on optical glass.(4) John Millington, another University

(1) Ibid., pp.(7–8). The Lectures commenced on 17 April 1827, and do not appear in the list printed in the Record of the Royal Institution (1968), pp.29–34.
(2) There were only twenty-one subscriptions, as opposed to fifty for Wallis' lectures a few months earlier.
(3) After the 1828–29 series, the sums entered in the volume of 'Subscribers to Lectures' cease to be divided between the R.I. and the lecturer.
(4) Faraday to Dionysius Lardner (Professor of Physics and Astronomy at University College from 1828 to 1840), 6 Oct 1827 (Williams, Selected Correspondence, i.168–9).

College professor and vice-president of Birkbeck's London Mechanics Institution, was also Professor of Mechanics at the R.I. from 1819 to 1829 and would have been well known to Faraday.(1) There were several men among the R.I.'s Managers in the mid-1820s who were also involved in the foundation of University College, men such as Henry Hallam, the third Marquis of Lansdowne and Lord John Russell.(2) In such a context it is no surprise to find a development such as the Juvenile Lectures as an expression of the concern with the education of the "youth of our middling rich people"(3) that preoccupied the circle involved in the founding of University College. Moreover, proposals for Juvenile Lectures were not unique to the R.I., although only at the R.I. did the proposition take root and flourish at that period, for in 1825 the R.I.'s City rival, the London Institution, proposed to deliver "A Course of 8 Lectures to illustrate the Progress of Science to Young People".(4) It is not clear from the surviving evidence whether these lectures were indeed delivered, but the intention itself furnishes additional evidence of the widespread concern for the education of a hitherto neglected group.

Whether the middling classes were among those whose children came to the Juvenile Lectures is difficult to ascertain. It is probable that the majority were the children of professional middle-class families. It is extremely rare to find any well-known or titled names among

(1) Faraday mentioned Millington in his letter to Lardner of 6 Oct 1827. Millington also gave Courses of Lectures at the R.I., in 1827 and 1829 certainly, if not also in the previous years ('Subscribers to Separate Courses of Lectures and to Juvenile Lectures', 1826-1835).
(2) See Berman, 'Introduction', Man.Min. VII, for the close links between the R.I. and the utilitarians of the 1820s, and Bellot, op.cit., for the part played by each in University College.
(3) Thomas Campbell to The Times, 9 Feb 1825.
(4) The course was to be given by Charles Frederick Partington, a popular scientific writer and lecturer (D.N.B.), who gave several courses of lectures for adults at the London Institution. If given, the course predates by a year the earliest R.I. Juvenile Lectures, but Miss Cutler has been unable to find any evidence about the proposed course other than a reference in the managers' minutes (Information from Miss J. Cutler).

subscribers in this early period, with the sole exception of Faraday's Juvenile Lectures. The timing of the lectures in the Christmas holidays might well be a factor, but it is very likely that the R.I. was providing for the same need that concerned the utilitarian reformers of the 1820s. For example, were the young people who came to the R.I. Juvenile Lectures of the same age and background as students attending courses at London university? Undergraduates began their university education at a much younger age, and it was not at all uncommon to find boys of fifteen or sixteen at university, in particular at London University, which was often regarded as a preparatory school for Oxford and Cambridge.[1] The word "juvenile" did not at that time mean young children in the sense that it holds today, but rather embraced the age group of fifteen to twenty year olds.[2] It is very possible that the so-called Juvenile Lectures were indeed for such young people, rather than for the young children who attend them today. In one important respect, however, the Juvenile Lectures were for many years unique, since from their inception, there was a strong family element in the audience. Adults unaccompanied by any children rarely formed more than around 15% of the audience. The proportion of juveniles varied somewhat, but not according to any discernible pattern. More interesting however is the fact that on average two-thirds of the juveniles were boys, and one-third only were girls. This is in marked contrast to the afternoon Courses of lectures, where among young people there were very few boys compared with the number of girls (See Tables 7 and 8).

As far as investigation has shown, there were at that time no other courses of science lectures given specifically for young people outside school or university, for the London Institution did not repeat their

(1) This attitude was exemplified in 1836 by Magdalene College, Cambridge, which instituted a scholarship for students from King's College, London (Hearnshaw, op.cit., p.138).
(2) The word was defined as meaning a "young person", "a youth", with no mention of children (Murray, N.E.D., V.ii.646).

Table 8 Juvenile Lectures[1]

	1850	1851	1852	1860	1861	1862	1870	1871	1872
		%			%			%	
Boys	49.0	39.7	39.3	39.1	34.9	60.6	49.4	35.5	51.4
Girls	19.0	14.0	23.0	19.3	18.2	20.4	21.1	29.1	27.1
Adults	32.0	45.3	37.7	41.6	46.9	19.0	29.5	35.4	21.5

experiment (if indeed it had taken place) until much later. Not until 1853 did the London Institution start presenting "educational lectures" for the families of proprietors.[2] Evidence from other institutions of imitation, or of duplication, is again of a later date, and for instance the Birmingham and Midland Institute began Christmas lectures on the R.I. model only in 1867.[3] In the second quarter of the nineteenth century the closest resemblance in terms of age group and social class were the lectures of the new colleges of London University. The Juvenile Lectures could even be regarded as competing with instruction provided at London University, and might well have truly done so had a greater number of Juvenile courses been given.

However, it is possible that the lower age-limit of children attending the Juvenile Lectures dropped as the years went by, for it is noticeable that in the 1840s a considerable number of the same people - usually families - bought tickets for both afternoon Courses and the Juvenile Lectures. Furthermore, as noted above, a certain number of those attending afternoon Courses were definitely under the age of sixteen, as they were called "master" in the ledgers.[4] This appears to suggest that both types of lecture were considered suitable for much the same age-group. But the number of "masters" becomes very small

(1) Figures compiled from 'Subscribers to Lectures', i.ii.iii. (1848-1875).
(2) The "educational lectures" did not survive unchanged for long, and in the 1860s appear to have become evening classes for adults rather than afternoon courses for juveniles. Christmas holiday courses at the London Institution apparently date only from the 1870s (Information from Miss J. Cutler).
(3) R.E. Waterhouse, The Birmingham and Midland Institute (1954), p.51.
(4) See above, Table 7, p. 181.

indeed after 1860, and also the number of people buying tickets for both types of lecture decreased in the 1860s. While it is impossible to prove satisfactorily, it seems that these factors might indicate that over the mid-century years, the Juvenile Lectures became properly an activity for children rather than for young people generally, while the afternoon Courses became definitely an adult pastime.(1)

It is difficult to determine how far the Juvenile lectures were intended to be instructive, how far they fulfilled a need for recreative activities designed with children in mind, and how far, as they became increasingly popular and well attended, the R.I. saw them principally as a useful source of income. Attendance was much higher than at a normal afternoon lecture, and the income from the Juvenile lectures could tip the balance in an otherwise poor year.(2) It is however worth noting that from 1834 onwards these lectures covered only the experimental sciences, and that the sciences of observation such as botany and geology were totally absent. This is unusual at such an early date, and such a bias can only have been due to Faraday's personal direction. The early Juvenile courses on "Architecture" (1828-29), "Geology" (1830-31), "Zoology" (1831-32) and "Botany" (1833-34) were never repeated. There was too a striking absence of attention to the applications of science, although Brande it is true did slip into his Juvenile lectures some discussion of applied science, as when for example he dealt with sea-salt as a source of chlorine (which was widely used as a bleaching agent in the textile industry) in a lecture on "The Ocean" (1842).(3) Apart from such rare exceptions, the Juvenile lectures concentrated on the

(1) Bence Jones for example sent his children to the Juvenile lectures in the 1850s when they were only eight and nine years old.
(2) For example, in the 1850s, attendance was over 600 people per lecture, and receipts were generally over £200 for these lectures alone.
(3) Fourth lecture of "A Course of six Lectures on the Chemistry of the Non-Metallic Elements, adapted to a Juvenile Auditory" (Box V (100), Printed lecture syllabuses).

theoretical principles of physics and chemistry. J.F. Daniell's series on "Franklinic Electricity" (1840-41), for example, involved detailed descriptions of the nature of electricity in all its varied phenomena.(1) Faraday himself gave nineteen courses of Juvenile lectures between 1827-28 and 1860-61, bearing the whole burden of these lectures, and still concentrating on pure science, in that decade following the Great Exhibition in 1851, when one might have expected more emphasis upon the utility of science. He never denigrated applied science. As he insisted to the Clarendon Commissioners in 1864:

> The sciences I speak of are all of them sciences most valuable in their application. They make up life. They make up our artificial state. They make up the body of physical science, and are to us most important in life.(2)

To Faraday, unlike most of his contemporaries, there was no difference in the type of mind or the type of person best suited to pursuing pure or applied science, as he regarded all science as ultimately useful; but science as knowledge sought for its own sake alone had an intrinsic value unmeasurable in any immediate utilitarian terms, and it was with such science that the Juvenile lectures were concerned.

In the mid-nineteenth century, then, there were three types of lecture in addition to the laboratory lectures (which ceased in 1853), each organised in a particular way, each given to a particular type of audience, and each with their own functions, although these might not be very clearly defined. General instruction, the diffusion of useful knowledge, rational entertainment, profit and the attraction of new Members all played some part. The sheer activity in this sphere should not be under-estimated, and entailed considerable administrative organ-

(1) J.F. Daniell (1790-1845), Professor of Chemistry, King's College, London (see D.N.B.); syllabus for Juvenile Lectures 1840-41, Box V (100).
(2) Royal Commission on the Public Schools, Parl.Papers, 1864 [3288] XXI.537, Vol.IV, evidence, pt.II.

isation, as well as time and effort on the part of the Institution's professors. In the changing atmosphere of the 1850s and 1860s it was not to be expected that the R.I. could maintain without some alteration its former position as a centre of scientific instruction. What these changes were and the R.I.'s reaction to them must now be discussed.

The 1850s were a period when the movement for the diffusion of useful knowledge was approaching its end, with a final burst of enthusiasm for the utility of science fanned by the success of the 1851 Great Exhibition. Its close companion, the ideal of self-help and self-improvement by self-instruction, had a long life yet to live,(1) but it was beginning to be apparent that reliance on auto-didactism on a national scale would not produce the necessary results. The 1850s saw the beginning of efforts to organise scientific and technical education on a much wider front, from the affiliation of the unions of mechanics' institutes to the Society of Arts in 1852 and the latter's first examinations in 1856, and the classes organised by the Department of Science and Art, to the first award of science degrees instituted by London University in 1858. Continental examples were cited with increasing urgency as models which should be copied if Britain was to maintain her industrial and commercial leadership.(2) The place of institutions such as the R.I. in a formal educational structure began for the first time to appear clearly inappropriate, especially since the Institution had already rejected in the preceding decade any proposal that it should be further involved in formal scientific education. On the other hand, during the same period London became ever more important, not only as the seasonal residence of "Society" and the centre of government during

(1) Samuel Smiles, Self-Help, was first published only in 1859.
(2) For example, Lyon Playfair carried out a study of Continental technical education in 1852, long before Matthew Arnold's better known study in 1868 (Cardwell, op.cit., p.88). Playfair also warned his audience at the R.I. in 1852 of Continental industrial progress and their emphasis on technical education (P.R.I., i (1851-54), 137).

the Parliamentary session, but also as a centre which few of the intellectual elite of this period could afford to ignore. The improvement of railway communications helped to make travelling easier, and London became the place visited regularly by the intellectual aristocracy, if they did not already live there, and, as seen in chapter 2, in the 1860s these men became an important element in the R.I.'s membership.

The R.I.'s reaction to these general changes was not a straightforward one, although it showed a remarkable sensitivity to changing trends. The Institution was thoroughly wedded to the medium of the lecture, and although it quietly dropped the laboratory lectures in 1853 without provoking any recorded protest, the raison d'etre of the other more or less educative lectures, the afternoon Courses, was thoroughly undermined. The audience in the lecture theatre on these occasions, with its large female element, was clearly an amateur one as far as the sciences were concerned, and one which in general did not seek a scientific education from these lectures. Nonetheless, the R.I. continued to feel that its lectures should be instructive at a higher level as well. One reason may well have been simply that its lecturers were so good and so expert in their presentation, that the time and effort put into the lectures was quite disproportionate to their value as instruction for such an audience, and could only be justified if a more elevated purpose were assumed. It was possible, and indeed it became increasingly necessary, to shift the emphasis to research. But as the old idea of the diffusion of useful knowledge disappeared, something had to replace it. What happened in effect was essentially a remoulding of rational entertainment in a superior guise. During the 1850s there was however first a brief attempt to inject rather more pure science into the programme, while continuing to deal with the more usual subjects of applied science. In the following decade, the 1860s, rational entertainment re-emerged in a form that was semi-instructive but quite outside the curriculum of normal education, but more importantly, was also excellent entertainment, fitting both contemporary ideas of family recreation and the cultured interests of the intelligentsia. The Institution indeed displayed an exceptional ability to provide rational entertainment at such a high level that the impetus of its success maintained the whole practice of giving lectures long after any real function they had had once disappeared, for the afternoon Courses lingered on another hundred years until the 1950s.[1] During the middle years of the nineteenth century they were however a vital ingredient in the Institution's success. Fossilisation of this type of lecture only came later.

One reason why the Institution was able to be reasonably sensitive to changing demands may be the fact that it had, at least from the 1830s, used the lectures as an indicator of the rising or waning popularity not only of the Courses themselves, but of the Institution. More important than the relatively small sums of money involved was the fact that a loss in this respect would call in question the acknowledged functions of the Institution. Enormous care was taken to keep exact records, and the accounts were so presented to enable an immediate calculation of profit or loss to be made on this item.[2] Attendance registers for both afternoon Courses and the Friday Evening Discourses were kept, showing the numbers attending each lecture. For each Course of lectures, the attendance figures were totalled at the end and subdivided to give an average attendance for each lecture.[3] From the 1860s, notes were added such as "snow", "wet" or even "Prince of Wales Marriage",[4] so that any external factors affecting a poor attendance

(1) They then became the now popular and well-attended "Schools Lectures".
(2) Receipts and expenses concerning the Courses were grouped together giving "Subscribers to Lectures" on the credit side, against "Expenses of Public Lectures" on the debit side ('Statement of Accounts', Annual Report, from 1848 onwards).
(3) 'Index to Lectures' (1841-1912), _passim_.
(4) _Ibid_., p.129 (Tuesday, 10 Mar 1863).

could be noted and discounted. It was a much more systematic attempt at record-keeping and data collection than had hitherto been made. The significance however is not so much what the actual registers themselves show, although a great deal of important information can be gained from them, but in the lengths to which the Managers went in order to keep a comprehensive record of attendance, and in the careful balancing of costs against receipts.

Nevertheless one cannot escape the feeling that the records were used more to explain the ups and downs of the immediate past than to provide the systemmatic data on which to base future policy decisions. In spite of the Managers' concern, efforts to boost attendances were not consistent, otherwise one would never find - as one does - a poorly attended subject or speaker reappearing.(1) One reason for this might be simply the two types of subscription and the way in which the data on attendance was kept. For example, in 1853 Frankland gave a Course on "Technological Chemistry", which had an average attendance for an afternoon Course at that time, namely 175 people at each lecture.(2) But if one turns to the number of tickets purchased for that particular Course, one finds that it was a mere fourteen, bringing in only 14 gns., while Frankland was paid 55 gns. for giving the Course.(3) The remaining 161 people who attended that Course were either R.I. Members, or people who had purchased a general subscription for all the Courses given that season, and one cannot distinguish between the two. It was therefore difficult to make an accurate estimate of profitability on

(1) For example, the geologists D.T. Ansted and William Pengelly were each invited to give several Courses at the R.I., although their average attendance was for the most part somewhat below normal; in 1863 Ansted's Course on the "Relations of Geology with Allied Sciences" attracted only 126 people per lecture, but three years later he appeared once more, lecturing on the "Application of Physical Geography and Geology to the Fine Arts", which attracted again only 123 people per lecture ('Index to Lectures' (1841-1912), pp.131, 147).
(2) Ibid., p.91.
(3) 'Subscribers to Lectures', i.163; Man.Min., X.414 (15 Nov 1852).

the basis of attendance at one specific Course. The situation was repeated in 1857 with Frankland's second Course at the R.I., where the average attendance was 131 people at each lecture, but only four tickets were purchased.(1) Yet this poor record did not prejudice his selection as Professor of Chemistry a few years later in 1862. It was only in the case of subjects of especial interest, or where the lecturer was extremely well-known, that the precise relationship between attendance and tickets purchased was clearer. The approach of the Managers therefore had to be general, as despite the wealth of statistical data, it was not possible to make the important specific analyses. It is however noticeable that in the 1860s the management was more aware of the demands and tastes of the Members, and that it made a far more prompt response, as changes made in the lecture programme demonstrate. But such a response was in all probability due as much to a discerning individual, most probably Bence Jones, as to a correct interpretation of inadequate statistics.

The attempt in the 1850s to give more attention to pure science shows the efforts made by the Institution to maintain some type of teaching function. It coincided too with Tyndall's arrival at the R.I., whose Course of nineteen lectures did after all take the place of what had been an instructive course on chemistry for medical students, and indeed no more was heard of medical students. Tyndall's lectures too were on physics, which could be dealt with at a theoretical level, unlike chemistry, which was so often dealt with in a manner which emphasized its practical applications. Tyndall also pitched his lectures at a more advanced level, arousing the Rev. John Barlow's anxiety: "I only hope that his (Tyndall's Course on) optics may not

(1) 'Index to Lectures' (1841-1912), p.108; 'Subscribers to Lectures', i.268.

be higher next year than the intellects of his hearers".(1) Barlow's anxieties were similar to those of a decade earlier over Brodie's lectures, and reflect his concern at any attempt to deal with science at a theoretical level, as he wrote at some length to Faraday in 1859:

> I think it very important that our Lectures should be original, & such as can only be given by the original research of the Lecturer; that they should be illustrated by striking experiments, so as to present a beautiful outline-map of the subject, such as any one, who would give continuous intelligent attention to the Lecture, would both apprehend and retain. Such were your own Saturday Lectures in old time. Now I dread the tendency of Tyndall's Lectures to become abstract - Illness and the meetings of the R. Soc. Council, deprived me of many of them last Spring but I thought some of them I did hear, difficult, especially as there was no text book for the student to refer to. This remark I would apply, with greater force, to the chemical lectures except the last. Many of these have been quite out of the comprehension of any but chemists. Within the last few years Jermyn Street has supplied the wants of those who require detailed and deep instruction. (2)

Barlow was in fact making some concession to new views in agreeing that the Courses of lectures should be original, and that in turn originality was the product of research. Clearly however he wished the level to be pitched for the amateur with the emphasis on attractive demonstrations. With regard to chemistry, the men who had given those recent Courses of lectures mentioned by Barlow were W.A. Miller (1854), J.H. Gladstone (1855), William Odling and A. Hofmann (1856), Frankland (1857), C.L. Bloxam (1858) and W.A. Miller again (1859).(3) All these men were professional scientists, and all had research achievements to

(1) Barlow to Faraday, 13 Aug 1859 (Williams, Selected Correspondence, ii.754 . This letter has been dated as written in 1854, but Tyndall's Course "On Light including its Higher Phenomena" was given in 1860, and other references in the letter to Tyndall's work on heat, confirm the later dating).
(2) Ibid., ii.754. "Jermyn Street" refers to the Royal School of Mines, which had its premises there.
(3) W.A. Miller (1817-1870), Professor of Chemistry, King's College, London, see D.N.B. William Odling (1829-1921), see below, p.280. Augustus Hofmann (1818-1892), Professor of Chemistry, Royal School of Mines, see D.S.B./ C.J. Bloxam (1831-1887), Professor of Practical Chemistry, King's College, London, see Boase, iv.436. /vi.461-4.

their credit. All the Courses were lengthy, generally ten to twelve lectures, and except for Frankland's Courses, on some aspect of pure chemistry. The level was greatly superior to Brande's perennial expositions of applied chemistry, and far closer to what was being provided for students in university lecture halls. Nor, apart from Frankland's Courses, were there any more Courses of the type given earlier by Edward Cowper on "Useful and Ornamental Arts" (1843) or on "Arts and Manufactures" (1844).(1) This may also be linked to the changing status of various scientific subjects, especially as applied science was for the first time beginning to be considered inferior to pure science. Chemistry, for instance, especially when practical chemistry, came lower down the scale than physics or astronomy.

The R.I. as the theatre where applied science had been discussed and applauded for so many years, did not altogether jettison useful knowledge. There were for example Courses on the electric telegraph or on photography.(2) During the 1840s and the 1850s between a quarter and a third of the total number of the Friday Evening Discourses concerned applied science. Public health topics such as ventilation or metropolitan water supplies, or new developments such as the regenerative steam-engine, the submarine telegraph, artificial illumination and iron ships were typical subjects. By contrast it is noticeable that during the 1850s Faraday ceased to give Discourses on applied science subjects, with the exception of his well-known Discourse "On Mr. Wheatstone's New Electric Telegraph in relation to Science" in 1858.(3) During this decade Faraday's subjects were almost entirely related to his own researches, although his final Discourses in 1860 to 1862

(1) Edward Cowper (1790-1852), inventor and Professor of Manufacturing Art and Machinery, King's College, London (see D.N.B.).
(2) William Carpmael (1804-1867), patent agent and consulting engineer, gave a Course "On the Electric Telegraph" in 1853; Thomas Malone, Director of the London Institution laboratory gave a Course "On Photography" in 1856.
(3) P.R.I., ii (1854-58), 555-60; see also Williams, Michael Faraday, pp.339-41.

reverted to the discussion of technological developments.(1) Tyndall too confined his Discourses to his own research work, covering varied topics on diamagnetism, the crystalline structure of slate rocks, glaciers and acoustics. In the mid-1870s Tyndall did however occasionally revert to the older practice of describing technological developments, as for instance in his Discourse in 1875 "On Whitworth's Planes, Standard Measures, and Guns".

Indeed it had become clear by the end of the 1850s that instruction at any other but a very general level was not the R.I.'s function, as the Visitors noted in their unusually revealing Annual Report of 1859. This Report devoted several paragraphs to the lectures, which were now such a "very prominent feature".(2) According to the Visitors, in former years the lectures by Davy and Thomas Young had imparted news of important discoveries to the outside world, while under Brande's direction they were "a valuable auxiliary to the young enquirer after knowledge; there being then scarcely any other place in which experiment could be made available to the student in chemistry".(3) They went on to say that times had changed, and that practical schools of chemistry and the hospitals "have rendered it unnecessary for the Royal Institution to provide Lectures suited only for the professed student".(4) Therefore the labours of the Professors were now devoted to research and "to the selection of important points to be discussed, or useful and practical information to be communicated to a large and general circle of enquirers", a passage which appears to refer to afternoon Courses of lectures and the Discourses alike.(5)

(1) Faraday's last Discourses covered light-house illumination, the electric silk loom, platinum, de la Rue's photographic eclipse results, and gas glass-furnaces.
(2) Annual Report (1859), p.x.
(3) Ibid., p.xi.
(4) Ibid., p.xi. The Visitors appear to have confused the afternoon Courses of lectures with the laboratory lectures, another indication of the persistent attraction of the R.I.'s former reputation as a school of chemistry.
(5) Ibid., p.xi.

Between 1858 and 1860 one may trace the pattern of change through the activities of one particular committee. In 1858 a "Committee for regulating the Weekly Evening Meetings" was formed.[1] Such a Committee had existed in the early 1840s, but its membership then had included nearly all Managers, and the absence of any record of meetings, suggests that its function at that time was merely to police the Evening Meetings. The 1858 Committee however consisted of four or five Managers only, together with Faraday. During the three years of its existence, its members were almost entirely drawn from those Managers of the scientific element who were most influential in this period: Bence Jones, Warren de la Rue, W.R. Grove, Charles Wheatstone, Col. Philip Yorke and J.H. Gladstone.[2] The purpose behind its formation was almost certainly to relieve Barlow, who was then in poor health, of the task of arranging the Friday Evening Discourses.[3] Faraday had always shared this job, and indeed invitations to give a Discourse were frequently the result of a suggestion by or to Faraday.[4] However, Faraday's health and memory were also deteriorating at this time, and until Bence Jones had been elected Secretary, he could not take over the task. But with a small committee of like-minded friends and colleagues, he was well able to direct matters as he pleased. The result was interesting: there were fewer Discourses given on non-scientific subjects, rather fewer on technological subjects and rather more on purely scientific subjects. This altered emphasis did not last. For the first time in a decade attendance at the Friday Evening Discourses dropped significantly. In

(1) Man.Min., XI.231 (3 May 1858).
(2) The only other men who served on this committee, in 1859, were John Percy, Professor of Metallurgy at the Royal School of Mines, and E.B. Denison, the Q.C. and amateur locksmith, who also busied himself with scientific affairs (see Appendix II.iii.).
(3) In 1858 Barlow was already contemplating resigning from the secretaryship (Tyndall, Journal VII, p.273 (15 Feb 1858)).
(4) See for example, Faraday's letter to William Thomson of 2 Nov 1859, or H.E. Roscoe's letter to Faraday of 26 Apr 1860, where in both instances Faraday's correspondent shortly afterwards gave a Discourse (Williams, Selected Correspondence, ii.934, 953).

1860, an outstanding year for scientific debate, only Faraday's two Discourses and T.H. Huxley "On Species and Races and their Origin" attracted a well-attended house, and indeed Huxley's audience was not abnormally large.(1) In particular the Discourses on applied science were very poorly attended.(2) During May and early June 1860 a "report on attendance at lectures" was read at the Managers' Meetings, suggesting that managerial concern was aroused.(3) In November of that year Bence Jones took over as Secretary. In the following year, 1861, there were no Discourses on technological subjects, and in contrast to the immediately preceding years, a quarter of the total number were devoted to non-scientific subjects, the last a development that will be examined in the following chapter. From that time onwards attendance steadily rose, rising on occasion to previously unattained heights. It appears that Bence Jones and his committee had analysed the problem and taken appropriate action.

At the same time changes were made in the basic organisation of the afternoon Courses of lectures. The total number of lectures indeed varied little, and remained steady at around sixty each season. However, the number of different Courses given each year was greatly increased, while at the same time the length of each Course was drastically reduced. Throughout the 1840s and 1850s there were between five and seven different Courses presented each year, of which three consisted of twelve lectures, and the remainder contained between six and eight

(1) Huxley's audience totalled 516, whereas a very popular subject attracted 700 or more people ('Index to Lectures' (1842-1865), p.90).
(2) For example, T. Crace Calvert "On the Influence of Science on the Art of Calico Printing" attracted only 272 people; Thomas Mayo M.D. "On the relations of the Public to the Science and Practice of Medicine", attracted even fewer, 264 people ('Index to Lectures' (1842-1865), pp.90, 92). In 1860 seven out of the nineteen Discourses attracted fewer than 300 people, as opposed to one or two, which had been the normal state of affairs in previous years.
(3) Man.Min., XI.330, 332, 334 (7 and 21 May, 7 June 1860). Unfortunately no further details appear in the Minutes. In the following year it became normal for the volume containing "Attendance at Lectures" to be laid on the table at Managers' Meetings, along with volumes of accounts, presents received, books purchased, and so forth (Ibid., XI.366 (4 Mar 1861)).

lectures. In 1862, the year Bence Jones wrote his Report on the Past, Present and Future of the Royal Institution, the number of different Courses was increased to nine, and by the end of the decade numbered twelve, even increasing in the mid-1870s to fourteen or fifteen.(1) At the same time the number of lectures in each Course was systematically further reduced until by the 1870s it was unusual to find any Course consisting of more than four lectures, with several of only two or three. The main exception was the obligatory annual Course of twelve lectures on physiology, provided for by an endowment in 1834, but from 1874 even this Course was reduced to a half-dozen.(2) Courses by the R.I.'s Professors too were rarely less than six lectures.

These changes were dictated first and foremost by the need to maintain audience levels. The R.I. was by no means unique in finding that variety and brevity were essential.(3) T.A. Malone, director of the laboratory of the London Institution, summarised the problem neatly:

> Instructional Lectures, or such as have the character of repetition, are never so fully attended as those courses which are shorter, have more novelty and concentration of subject, or are recommended by the eminence of the Lecturer.(4)

One may surmise that the need for brevity and variety became equally clear in other means of communication, and it certainly did so in periodical publications, where quarterlies were replaced first by monthlies, then by fortnightlies, and increasingly by the end of the 1860s by the weekly.(5) The larger question, equally pertinent to

(1) See lists of Courses of Lectures appended to the Visitors' Annual Report each year from 1848.
(2) This Course of lectures was the sole duty of the Fullerian Professor of Physiology, who was elected every three years. See Appendix I for a list of those elected.
(3) It was around this time that notes on the weather and the temperature were added to the attendance register, which tend to indicate a low level of perseverance on the part of the audience in the lengthier Courses ('Index to Lectures' (1841-1912), p.124, 138).
(4) London Institution, 'Report of the Committee of Management', 1861, p.3.
(5) Weekly periodicals already existed, notably the Athenaeum and the Spectator, both founded in 1828. From the 1860s however many of the new periodicals, including those with a specialist scientific interest, were weeklies.

periodicals, is the change of purpose implied by brevity and variety, for these two qualities were scarcely the essential attributes of serious instruction. Of course, these instructive lectures at the R.I. had never been so serious as to be suitable only for the professed student. They had always operated at two levels, the instructive and the entertaining. The change however in the 1860s was a shift to something that was more simply entertainment for itself alone, a change which was all the more marked coming as it did after the austerely scientific emphasis of the 1850s. The entertainment thus provided might indeed be at a high level, and as such could be considered improving, but it ceased to be intentionally instructive as its main aim. It catered for a more general cultural interest in knowledge. Science and technology could no longer be handed out in the lengthy and often indigestible fashion of former years. The emphasis on utility as the prime justification for scientific activity too now disappeared.

Over and above the need to maintain audience levels by providing entertainment rather than instruction, the increase in the number of Courses did have an important effect in broadening horizons, and consequently in maintaining the Institution's reputation and appeal to the educated classes. This may be seen in the change that occurred in the type of lecturer engaged. For example, during the 1840s there had been eighteen different lecturers on scientific subjects, leaving aside non-scientific subjects for the moment.(1) Eight of this number came from London University (University and King's College providing four apiece), three came from the Geological Survey, and two from London teaching hospitals.(2) The remaining five were the Rev. Robert Walker, Reader

(1) For speakers on non-scientific subjects, see below, pp.237-42.
(2) The speakers in question were R.E. Grant (1793-1874) comparative anatomist, John Lindley (1799-1865) botanist, W.B. Carpenter (1813-1885) naturalist, and Richard Potter (1799-1886) professor of natural philosophy and astronomy, from University College; Thomas Rhymer Jones (1810-1880) zoologist, Edward Cowper (1790-1852) professor of

in Experimental Philosophy at Oxford; E.W. Brayley, scientific author and Librarian of the London Institution; John Scott Russell, naval architect and secretary to the Society of Arts; the Rev. W. Scoresby, scientific author and divine; and one remains unidentified.(1) A total of 72% came from the close-knit world of the London academic community, which was not at that time a socially distinguished world. Moreover, it was common for university lecturers in the earlier nineteenth century to make a round of several different institutions, giving lectures in order to supplement their meagre incomes. For example, there was considerable duplication in lecturers between the R.I. and the London Institution in the 1840s, with the same men appearing from London University and the Geological Survey.(2) The R.I. was often the first stop on the lecturer's round, and the London Institution the second, the lecturer sometimes repeating more or less the same course.(3) Throughout the 1850s Tyndall too gave a regular course of lectures at the London Institution. Inevitably the type of person available in the 1840s and early 1850s to give "respectable" lectures was drawn from London

manufacturing art and machinery, J.F. Daniell (1790-1845) physicist and D.T. Ansted (1814-1880) geologist, from King's College; John Arthur Phillips (1800-1874) geologist, Edward Forbes (1815-1854) naturalist and Lyon Playfair (1818-1898) chemist, from the Geological Survey; George Fownes (1815-1849) chemist, and W.W. Gull (1816-1890) physician, from London teaching hospitals. All these men appear in the D.N.B., but it should be emphasized that few of them were known outside scientific circles at this time, the 1840s, and several were only at the beginning of their careers.

(1) Rev. Robert Walker (1801-1865), Boase, iii.1151-2; E.W. Brayley (1802-1870), J. Scott Russell (1808-1882), and Rev. W. Scoresby (1789-1857), D.N.B. No more is known of the last of the list, George Shaw, other than the subject of his lectures, which was "Mechanical Philosophy" ('Index to Lectures' (1841-1912), p.45).

(2) For example, W.B. Carpenter, E. Cowper, E. Forbes, R.E. Grant, Lyon Playfair and John Lindley all gave course of lectures at the London Institution between 1845 and 1850 (Guildhall Library, London Institution MSS SL50/2, A Collection of syllabuses of lecture courses at the Institution, 1845-55).

(3) For example, Edward Cowper gave a Course in 1851 at both Institutions on "Manufactures and Construction", which must have covered much the same ground, although his course at the London Institution consisted of four lectures, as against seven at the R.I.

academic or medical circles.

In the 1860s the picture changed. In this decade twenty-seven different men gave Courses of lectures on scientific subjects alone, one-third more than in the decade of the 1840s. Of these twenty-seven only three came from London University; four came from the South Kensington complex of the Royal School of Mines, the Royal College of Chemistry, and the Natural History Museum, and a further five from the London teaching hospitals.(1) The percentage provided by these institutions dropped therefore from 72% to 44.4%. The remaining lecturers showed a far more varied provenance: there were two foreigners, Herman Helmholtz and Emil du Bois Reymond from Berlin; William Thomson (Lord Kelvin), Thomas Anderson and Robert Grant from Glasgow; Archibald Geikie from the Scottish Geological Survey; Lyon Playfair from Edinburgh; Henry Roscoe from Owens College, Manchester; as well as independent men of science such as Sir John Lubbock (who became a Manager for the first time in this decade), or William Pengelly, the Devonshire geologist.(2) There was also less duplication in both subject and speaker with the London Institution. There were fewer London professors and hospital teachers providing knowledge which was not very different to that found in their own academic lecture rooms. Many of the lecturers drawn from further afield were indeed academics, but there was now a considerable difference between an R.I. lecture and their normal professorial lecture.

(1) This number includes Frankland, who gave Courses at the R.I. in 1861 and 1863 while still lecturer on Chemistry at St. Bartholomew's Hospital. He has therefore been included among those from London teaching hospitals, not among those from the Royal College of Chemistry, which he did not join until 1865, two years after his appointment to the R.I.

(2) Herman Helmholtz (1821-1894), D.S.B.,vi.241-53;Emil du Bois Reymond (1818-1896), ibid.,iv.200-6. William Thomson, Lord Kelvin (1824-1907) physicist, Thomas Anderson (1819-1874) chemist, Robert Grant (1814-1892) astronomer, Archibald Geikie (1835-1924) geologist, Henry Roscoe (1833-1915) chemist, William Pengelly (1812-1894) geologist, see D.N.B. On Lyon Playfair, see above, p.207, and Sir John Lubbock (1834-1914), D.N.B. and Appendix II.i.

Their appearance at the R.I. was due in part to a wider invitation policy by the Managers, and Bence Jones himself as a scientist of some note was in touch with a great number of scientific men in many places. But in part too, many of these men would come to London anyway at some moment during the season, since, as already noted, London by the 1860s had become a centre which few of the intelligentsia could totally ignore, and if a visit was combined with a Course of lectures or a Discourse at the R.I., that was all to the good. Frequently, though not invariably, Courses of lectures by people from outside London were given between the end of April and early June, which was for many reasons a favourite time for visiting London.(1)

A wider invitation policy was equally apparent in the choice of speaker for the Friday Evening Discourses. In the 1840s once again London University, the Geological Survey and the teaching hospitals provided the majority of regular speakers. In that decade there is some evidence too that a good Discourse at the R.I. was considered helpful in advancing a London career. In 1844 Edward Forbes, at that time a young naturalist, asserted that his first Discourse at the R.I. helped to obtain a grant of £500 from the Government towards the cost of publishing his Aegean researches, and into the bargain, an invitation from Peel to attend a soiree in honour of the King of Saxony.(2) A.C. Ramsay, a young geologist in 1847, felt that his Discourse that year was instrumental in securing the favourable opinion of the University College authorities when he applied for the post of professor of geology, which he duly obtained.(3) Such recollections emphasize the narrow confines

(1) For example, the annual gathering of the Quakers was always held in London in May. The diarist, Caroline Fox, described these annual pilgrimages to London and the round of calls that accompanied them, which included on occasion a visit to the R.I., as in 1851 when she listened to Faraday's Discourse "On Schonbein's Ozone" (Wendy Monk (ed.), The Journals of Caroline Fox: 1835-71 (1972), p.201).
(2) Wilson and Geikie, op.cit., p.364.
(3) Geikie, Ramsay, p.99. Sir Charles Lyell, doyen of British geologists, testified to Ramsay's abilities as a lecturer having heard him at the R.I. (ibid., p.102).

of the London academic and professional world in the 1840s, in contrast to the 1860s for which no such comments have been found. It is true that the London academics still made regular appearances, and indeed the list of speakers they provided makes impressive reading: W.B. Carpenter, W.K. Clifford, A.C. Ramsay, Augustus Hofmann, Augustus Matthiessen, Alexander Williamson, John Percy, and of course the ubiquitous T.H. Huxley.(1) But there were more men from Oxford - J.O. Westwood, A. Vernon Harcourt, Nevil Story Maskelyne, George Rolleston; and also from the Scottish universities - W.J.M. Rankine, G.J. Allman, A. Crum Brown, H.C. Fleeming Jenkin, William Thomson and Alexander Herschel; and even from Cambridge, which with its emphasis on the mathematical approach, had tended to be critical of Faraday, who was relatively untutored in mathematics, and also of Tyndall, who was German trained, and in the 1840s had contributed only one speaker, William Whewell.(2) Other regular speakers in the 1860s included the astronomers Balfour Stewart, William Huggins and Norman Lockyer, in addition to occasional lectures by scientific discoverers such as William Crookes, chemist and editor of the Chemical News, or W.H. Perkin, founder of the chemical dye industry.(3) In short, in the 1860s both the Courses of lectures and the Friday Evening

(1) W.K. Clifford (1845-1879), astronomer; Augustus Matthiessen (1831-1870), chemist; Alexander Williamson (1824-1904), chemist; John Percy (1817-1889), metallurgist; T.H. Huxley (1825-1895), D.N.B. On Carpenter, see above p.206 n.2, and Ramsay, p.209 and D.N.B.

(2) J.O. Westwood (1805-1893), entomologist and palaeographer; N.S. Maskelyne (1823-1911), mineralogist; George Rolleston (1829-1881), physician; W.J.M. Rankine (1820-1872), civil engineer; G.J. Allman (1824-1904), naturalist; H.C. Fleeming Jenkin (1833-1885), engineer and electrician; Alexander Herschel (1836-1907), physicist; William Whewell (1794-1866), Master of Trinity College, Cambridge; D.N.B. On A. Vernon Harcourt (1834-1919), chemist, see D.S.B., vi.109-10; and A. Crum Brown (1838-1922), chemist, ibid., ii.514-6. Men from Cambridge who lectured at the R.I. in the 1860s included J. Clerk Maxwell (1831-1879), the first mathematician to appreciate Faraday's ideas on lines of force, and G.G. Stokes (1819-1903), Professor of Mathematics. See D.N.B. on both men.

(3) Balfour Stewart (1828-1887), William Huggins (1824-1910), Norman Lockyer (1836-1920), William Crookes (1832-1919) and W.H. Perkin (1838-1907), see D.N.B.

Discourses were given by men who were more distinguished, who were drawn from far and wide, and in addition they dealt with a greater range of subjects.

With broadening horizons it was natural that the subject matter both of Courses of lectures and the Friday Evening Discourses should have become more varied. In any case the choice of subject naturally reflected the interests and developments of the time, and it so happened that from the mid-century new discoveries followed each other faster than ever before. Geology and astronomy furnish good examples. Geology appeared regularly in the programme until the early 1850s, but less frequently in the following years. In the 1860s however interest in the subject sharply revived, as consideration of Darwin's work meant that geologists either had to revise their timescales drastically, or, if hostile to Darwin, to reassess the geological evidence in order to refute him. Similarly, although some interest in astronomy occurred as a reflection of public enthusiasm aroused by the discovery of Neptune in 1849 and by the solar eclipse of 1851, it then virtually disappeared from the programme of both Courses and Discourses until the 1860s, when it reappeared in response to the rapid progress made in this field thanks to the application of spectrum analysis, and the considerable stir caused by Lockyer's work in spectroscopy and solar physics at the end of the decade. Similarly, some subjects disappeared, such as comparative anatomy, formerly a pillar of orthodox science, and were replaced by new sciences such as physical chemistry, biochemistry, meteorology, zoology, as the broad field of scientific knowledge was broken up into smaller and smaller specialised allotments. Throughout the period, however, the subjects which attracted an abnormally large audience - that is, one of 800 people or more, when the theatre was filled to overflowing - were, with the exception of those by the R.I.'s Professors themselves, almost invariably on geology or astronomy. The list of the seven best attended Discourses on scientific subjects between 1840 and 1875 bears out the point:

1850 Sir Roderick Murchison - The Distribution of Gold Ore in the Crust and upon the surface of the Globe.
1850 Sir George Biddell Airy (Astronomer-Royal) - On the Present State and Prospects of Terrestrial Magnetism.
1851 Rev. Baden Powell - On the Recent Pendulum Experiment showing the Rotation of the Earth.
1869 W. Huggins - Further Results of Spectrum Analysis applied to the Heavenly Bodies.
1870 T.H. Huxley - The Pedigree of the Horse.
1871 N. Lockyer - The Recent Solar Eclipse.
1876 T.H. Huxley - The Recent Work of the "Challenger" Expedition, and its bearing on Geological Problems.(1)

But this is not very surprising, for quite apart from new discoveries in the subject, in the nineteenth century, geology was the amateurs' science par excellence. Astronomy during this period was likewise the aristocrat of amateur learning, involving as it did complicated mathematics, expensive equipment and a great deal of time. Private observatories for example were by no means rare.(2) These two subjects were therefore always of particular interest to an amateur audience such as that which patronised the R.I. Moreover, the speakers on these subjects were all well-known outside purely scientific circles. In general, chemistry, the engineering sciences and medicine had no such wide appeal, unless there was an extrinsic reason, such as the presence of a royal patron, to push up attendance levels.

Rational entertainment at a high level was thus the keynote of the 1860s. The instructive purpose of former years virtually disappeared although this might be maintained as a beneficial side-effect. However, during the same period there was, as might be expected, a marked shift towards entertainment for itself alone. This may be seen in the increasing

(1) 'Index to Lectures' (1842-1865), pp.43, 48, (1866-1939), pp.22, 30, 35, 39. Apart from the first two listed, the text of these Discourses may be found in the P.R.I.
(2) A guide to London in 1851 included a list of fourteen private observatories in and around London (John Weale (ed.), London Exhibited in 1851 (1851), pp.680-1).

importance accorded as time went on to one element in all the R.I.'s lectures, namely, experimental exhibition. The R.I. had a name for experimental demonstration gained in Davy's day, and from Faraday's time onwards it has never lost it. In the mid-century great emphasis was placed upon this attraction; it was singled out for especial mention in the official prospectus,(1) and money was provided for apparatus, diagrams and materials.(2) From at least 1830 one of the chief purposes of the R.I.'s museum was to provide demonstration equipment for the lectures, as a 'Prospectus' of that date noted: "For this purpose, the Instruments, Models, and Specimens in the repositories of the Institution are powerful auxiliary means".(3) From 1856 there was a standing arrangement with the Geological Survey to borrow specimens and apparatus.(4) A Discourse might have at least ten complicated experiments and many more simpler ones. Faraday's notebooks containing brief outlines of his Discourses show that he presented around thirty demonstrations each time.(5) A good deal of time was spent on their preparation, and this was time well spent, for the R.I.'s experiments rarely failed, although at this period the success of most experimental demonstrations was very doubtful. Faraday was renowned for his expertise in this respect, which even in his later years called forth the admiration of those watching, for "his manipulation was marvellous".(6) It is nonetheless important to note that while Faraday's experiments were

(1) See above, p.183.
(2) This item came under the heading "Expenses of Public Lectures - Sundries"; the amount spent was generally between £60 and £80, but could be as high as £152.13.1 as in 1861 ('Statement of Account', Annual Report, 1840-1870).
(3) 'Syllabus of Lectures' (1830), p.1 (Guard Book i.).
(4) Sir Roderick Murchison to Barlow, 9 May 1856 (Box XVIIB.219G).
(5) Faraday MSS, Notebook (61), *passim*.
(6) A. Bain, *Autobiography* (1904), p.129. Bain, the psychologist and logician, referred to a Discourse by Faraday in 1851 "On Atmospheric Magnetism". Like many of Faraday's contemporaries at this time, he admired Faraday's experimental skills, but failed to follow his theoretical ideas, which Bain dismissed as "confused and unintelligible" (*ibid*., p.129).

visually exciting and imaginative, they were always subordinate to the theme of his argument, as W.F. Pollock's wife commented: "He never suffered an experiment to allure him away from his theme".(1)

By the 1860s however, it is arguable that the role of the demonstration in either of the different types of lecture became more important than that of a visual aid either for didactic or informative purposes. On the one hand, as science became more complicated, it was indeed necessary to invent new ways and to stretch the means of presenting it in order to bridge the gap between scientist and non-scientist. But on the other hand, the 1860s were a decade when science was still by and large comprehensible to a large number of people, certainly to a good number of the sort who came to the R.I., and it seems that the demonstration itself became the central feature of the entertainment. There was particular emphasis on beauty, and an effort to delight the eye, which found an enthusiastic response in the audience.(2) Furthermore, the experimental demonstration was often very dramatic, and it therefore emphasized the theatrical, and thus the entertaining aspect of the occasion. Tyndall could allow his theatrical and his poetical vein to range freely, and not for nothing was he dubbed "Poet of Science".(3) For example, the experiments in his Friday Evening

(1) (Lady Pollock), 'Michael Faraday', St. Paul's Magazine, vi (1870), 293, which gives an excellent picture of Faraday in the lecture theatre. A long passage from this article is quoted in Williams, Michael Faraday, pp.333-4, with the authorship attributed to Lady Holland. W.F. Pollock's memoirs confirm however that his wife wrote the article (Pollock, op.cit., ii.167).

(2) Ideas on what constituted beauty, and the view that art should be the exact reflection or mirror of nature, were fairly widely discussed at this period. One may perhaps point to such notions as one reason for the great popularity of such a Discourse as that given by Richard Liebreich, the ophthalmologist, "On the Effects of certain Faults of Vision on Painting, with especial reference to Turner and Mulready" (1872), which for a lecture by a virtually unknown man, attracted the unusually large audience of 770 people ('Index to Lectures' (1866-1939), p.42).

(3) Quoted by Herman Helmholtz to Emil du Bois Reymond, 15 May 1864, cited in L. Königsberger (trans. F.A. Welby), H. von Helmholtz (1906), p.225.

Discourse on "Some Physical Properties of Ice" (1858) included one where a ray of light was passed through a block of ice, thus causing exquisite flower shapes to be projected onto a screen.(1) On another occasion Tyndall deliberately leapt over the lecture table in the middle of an experiment.(2) Tyndall indeed did have genuine gifts for the exposition of science, a fluent literary style, a knack for finding the happy analogy to explain some phenomenon, and an ability to touch the imagination, despite a reputation for sentimentality among the more sophisticated.(3) Nevertheless, once cannot but feel that the tendency to demonstrate was overdone, not only by Tyndall, but generally. As Becker recorded, on one occasion the audience had to "endure, without a murmur, an atmosphere heavily charged with noxious gases".(4) Equally Frankland included a lavish number of demonstrations as, for example, in his Course of lectures on technological chemistry (1853), when "such processes as dyeing and calico-printing, gas-making, the manufacture of earthenware and porcelain, &c." were all carried out upon the lecture-table.(5) The firm which manufactured Royal Worcester even sent one of their potters with his wheel to produce vessels before the audience.(6)

The inevitable consequence of such a policy was to make each occasion "a series of demonstrations rather than a lecture", as Sir Lawrence Bragg said many years later of the Schools Lectures which finally replaced the afternoon Courses, maintaining that this helped to maintain national standards of exposition and to infuse into science

(1) P.R.I., ii (1854-58), 454-7.
(2) Quoted in D. Thompson, 'John Tyndall and the Royal Institution', Annals of Science, xiii (1957), 15. Tyndall's tendency to showmanship appears to have become stronger as the years passed.
(3) Tyndall was caricatured as the sentimental and effusively eloquent Mr. Stockton in W.H. Mallock's The New Republic (1874). For a more favourable view of his gifts as a lecturer and writer, see Eve & Creasey, op.cit., pp.330-9.
(4) Becker, op.cit., p.47.
(5) Frankland, op.cit., p.130.
(6) Ibid., p.130.

teaching generally a number of good demonstrations.(1) This might be true of Sir Lawrence's time when science teachers were among the audience, but in the latter half of the nineteenth century the effect was to give priority to entertaining the audience. Science was made pretty and amusing, but scarcely instructive, and except in the hands of an expert, the theoretical content inevitably became less and less demanding.

At the same time the R.I. succumbed to the passion for formalising procedures that was a characteristic of the period. The Friday Evening Discourse no longer remained the informal conversazione, and in the mid-century rigid rituals were developed. On Friday Evenings the doors were opened at a certain time, the front seats reserved for the Managers, and the President and Managers entered in procession at a fixed moment.(2) When the theatre clock, which still today retains its musical but penetrating hourly chime, sounded the hour, the doors were opened and the lecturer entered. When the clock struck again, the Discourse had to be closed by a few short sentences, and any overrunning of the allotted hour was always severely remarked upon, not so much by the Managers as by the Members, who had an acute sense of the proper forms.(3)

Moreover, in itself this formalisation tended to highlight the role of the demonstration, and the theatrical aspects of the scene. Consider Becker's description of one of Tyndall's afternoon lectures, where much of the same ritual and formality applied as on Friday

(1) Sir Lawrence Bragg, 'The Schools Lectures at the Royal Institution', Public Schools Appointments Bureau Bulletin, 89 (July 1960), 25. Sir Lawrence Bragg (1890–1971) was Director of the R.I. and Fullerian Professor of Chemistry from 1953 to 1966.
(2) This happened sometime in the 1840s, as by 1851 Barlow drew up formal 'Regulations for Friday Evenings' (undated, Guard Book iii, item 146; Man.Min., X.333 (2 June 1851)).
(3) For example in 1850 the Astronomer-Royal "Airy forgot himself, and lectured an hour and three-quarters!" (Journal of A.C. Ramsay, 15 Mar 1850, quoted in Geikie, Ramsay, p.159). This was severely remarked on by several of those present as "Very bad management indeed!" (E. Cecil Curwen (ed.), Journal of Gideon Mantell, Surgeon and Geologist: Covering the years 1818–1852 (1940), p.251).

Evenings. The audience was seated and waiting; "The well-known lecture table is covered with apparatus, and a huge bath tub occupies a considerable space".(1) The laboratory assistant was busy putting the finishing touches, until "punctual to the stroke of three, a tall slender man, of undeniably Scottish aspect, steps to his place behind the lecture table", his arrival greeted by a murmur of applause.(2) "The lecture, interesting in itself, is rendered doubly so by numerous and beautiful experiments ... and the applause is great on the light-carrying power of water being demonstrated by an experiment of singular beauty. The prescribed hour appears unnaturally short when the clock strikes, the lecture is then closed by a short sentence, and, amid a mighty rustling of silks, the audience prepare to depart".(3) A short crush on the stairs, and then the audience scrambled for their carriages. It is not too far-fetched to say that the description was one of a theatrical performance, where the experiments provided the main dramatic interest.

Equally in the Juvenile lectures, presentation was all-important, since the audience was composed of young people, and since the decrease in overlap with the afternoon Courses of lectures suggests that the lower age limit probably dropped as time went on. Few of the children or young people present would have had any knowledge of science, which would not have been a normal part of their school curriculum. The demonstration therefore naturally played a very large part in these lectures too. Furthermore, it is possible that Faraday was influenced by the ideas of Pestalozzi on the use of objects to leave an ineradicable impression on a young child's mind. The use of object lessons and

(1) Becker, op.cit., p.51.
(2) Ibid., p.51. Tyndall was in fact of Irish extraction, his forbears having moved from Gloucestershire to Ireland towards the end of the seventeenth century (Eve and Creasey, op.cit., pp.1-2).
(3) Becker, op.cit., p.51.

visual aids as part of the material of instruction was certainly fairly widely discussed in England in the 1820s. One of Pestalozzi's disciples, the Rev. Charles Mayo, lectured at the R.I. in 1826, the same year that the Juvenile Lectures were first given.(1) Mayo's arguments were that learning began with a child's own experience, and that teaching must be graded in accordance with the child's developing intelligence. It is extremely likely that Faraday listened to Mayo, and Faraday certainly appears to have put these ideas into practice. His notes on his own first series of lectures in 1827 sum up this approach with the instruction:

> Touch principally upon tangible chemistry, and then only on those parts which, being constantly before us in one form or another, ought to be well understood in the first place, if only as being part of general knowledge. (2)

Faraday devised experiments using the tangible and familiar objects of everyday experience such as candles and sealing wax, the coal scuttle and fire tongs. Starting with the familiar and the simple, he progressed to a clear and easily grasped explanation of the fundamental laws of nature. His ability to touch the imagination has been well described by Professor Pearce Williams.(3) His genius too lay in his unrivalled skill at turning the commonplace into the vehicle for drama, and many of his experiments were extremely exciting. It would appear that Faraday was the first person to do this in the experimental sciences, and moreover, the first to treat the subject in a theoretical way for young people, for it deserves to be reiterated that the objective was not to describe how science could be applied in everyday life, but to explain and illuminate its theoretical principles.

While the Juvenile Lectures were in Faraday's hands distinctly

(1) S.J. Curtis and M.E.A. Boultwood, Introductory History of English Education (2nd ed. 1962), p.117.
(2) Bence Jones, Faraday, i.356.
(3) Williams, Michael Faraday, pp.344-8.

more than a variation on the theme of the diffusion of useful knowledge, in them too as time went on an increased emphasis on entertainment for its own sake can be seen. One may surmise that this was as much as anything a result of the changed meaning of the word "juvenile", and that the children who came to the R.I. Christmas lectures really were children, although it was not until 1922 that the R.I. officially defined "juvenile" as covering the ages of ten to sixteen years.(1) From the late 1850s, those young people aged between sixteen and twenty who had been the concern of the utilitarians in the 1820s, were well provided for, especially as the evening class movement got under way, and for instance, the Evening Class Department of King's College, London, opened in 1855.(2) Indeed by the 1860s there were occasional perceptive comments that science as presented in the Juvenile Lectures was not necessarily very instructive, and thus not to be thought of as a model for classroom teaching, either at a simple or an advanced level. The R.I.'s views on education, either for adults or for juveniles, were in any case never very closely defined or consistent, as indeed was shown in the afternoon Course of lectures on education given in 1854. At the instigation of Bence Jones,(3) with Faraday's enthusiastic support, the R.I. presented a Course of lectures, where the seven speakers, who included Faraday and the omniscient Whewell, gave their views on the importance of the different sciences "as a means of education for all classes".(4) The significance of this Course was not so much in the content of the lectures, for each speaker tended to advance his subject

(1) 'Report of the Sub-Committee on lectures', 3 July 1922, pp.7-8.
(2) Hearnshaw, op.cit., p.252.
(3) Tyndall, Journal V, p.316 (4 Feb 1854).
(4) This phrase was included as a sub-title in five out of the seven subjects, namely those covering language (i.e. philology), chemistry, physics, physiology and economic science. The other two lectures were by William Whewell, "On the Influence of the History of Science upon Intellectual Education", and by Faraday, "Observations on Mental Education".

to the exclusion of the others and none put forward any comprehensive view of the place of the various branches of science in education; nor even in their distinguished audience, as two of the lectures were attended by the Prince Consort. It lay rather in the fact that the Managers took the most unusual step of printing the lectures and distributing them to the Institution's Members, a step taken perhaps once more at Bence Jones' prompting.(1) Never before had the R.I. spent money on propaganda for scientific education and indeed never did it do so again. However, Faraday's views on the appropriateness of science as an intellectual discipline were not widely shared outside his profession. Characteristically, his opinions were too free from any divisiveness on the grounds of social suitability and application. It may be argued too that the very attractiveness of the way in which science was presented militated against its use in education as an intellectual discipline. The emphasis on experiments and demonstrations was in reality misleading, as the botanist, J.D. Hooker, wryly commented later:

> Tyndall used to say that you had only to show boys scientific experiments to make them love science. Bence Jones was nearer the mark when he said, 'all the boys care for and call Chemistry is a blaze, a bang, and a stink'. (2)

Advocates of a reformed liberal education pointed out that science had first to become a proper intellectual training. W. Johnson, the Eton master, wrote in the Essays on a Liberal Education (1867), edited by F.W. Farrer, that the impression left by even one of Faraday's brilliant lecture-demonstrations was very fleeting.(3) It is after all difficult for the person without considerable scientific knowledge to comprehend

(1) Lectures on Education at the Royal Institution by Drs. Whewell, Faraday, Latham, Daubeny, Tyndall, and Hodgson, and Mr. J. Paget (1854). The Managers' Minutes name Bence Jones, W.F. Pollock and the Secretary (Barlow) as those requested to make arrangements for the publication of the lectures (XI.60 (8 May 1854)).
(2) L. Huxley (ed.), Life and Letters of Sir J.D. Hooker (1918), ii.330.
(3) Cited in Curtis and Boultwood, op.cit., p.138.

and retain more than a very small number of experimental demonstrations.

Tyndall's Juvenile lectures in the 1860s soon became as popular as Faraday's had been, but by then Tyndall had become extremely well-known. Juvenile lectures by other R.I. professors throughout the 1870s and 1880s were never so popular, and where a lecture by Tyndall filled the theatre with 800 people, Gladstone or Dewar attracted only little over half that number.(1) Attendance therefore in the later period depended more on the fame of the lecturer than on the subject matter of the course. It may be noted too that although from the 1860s onwards Tyndall, Frankland, Gladstone and Bence Jones were involved as individuals in efforts to improve scientific education,(2) there was an almost total lack of public mention of the R.I. as a model with reference to educational questions (or, for that matter, with reference to questions of scientific research). For example, the only mention of the R.I. in all the reports of the Devonshire Commission, which sat from 1872 to 1876, came from Joseph Henry, the Secretary of the Smithsonian Institution in Washington.(3) In spite of the R.I.'s innovations, and in spite of its superb mastery of the techniques of presentation, the Institution was evidently not considered as having any relevance to scientific education. In this period the Juvenile Lectures became purely a family entertainment. It may certainly have been an improving entertainment, but it was one that was viewed by the audience in the light of a potential hobby, rather than one that had any relation to education proper as found in the content of the normal school curriculum, or in

(1) 'Index to Lectures' (1841-1912), passim.
(2) For example, Tyndall and Bence Jones were both members of the British Association committee set up in 1866 to consider the question of textbooks for secondary education. Frankland campaigned for an extension of educational facilities, comparable to those available on the Continent (Cardwell, op.cit., p.124). Gladstone was a member of the London School Board, as noted above, p.52.
(3) Royal Commission on Scientific Instruction and the Advancement of Science, Parl.Papers, 1872 [c.536] XXV.pt.1, p.91.

its presentation in the classroom.

In these thirty years, then, all the lectures given at the R.I. had to some extent been transmuted from useful and instructive entertainment to something more akin to entertainment pure and simple. The demise of the movement for the diffusion of useful knowledge, once strong at the R.I., was to be seen here as in other institutions. Other institutions failed however to achieve that subtle transformation which continued to feed the medium with active life, and this was especially true of those institutions which catered for a lower social class than did the R.I. For example, the Whittington Club, designed to provide both the civilising pleasures and benefits of a club together with the provision of useful knowledge to the lower middle-classes of the metropolis, failed to survive except as a club for businessmen, senior clerks and solicitors.(1) The educational lectures at the London Institution virtually disappeared after 1874, and in addition the lecture-conversaziones there began to take the form of musical evenings rather than scientific soirees.(2) By contrast the R.I. maintained its popularity, and appealed to what was in effect a broader range of society than ever before, thereby ensuring the continued support of its other more enduring scientific activities. However the changes described above left the Institution to face the problem that its lectures were now concerned not with education, but primarily with popular exposition. This was an activity which tended to arouse the contempt of the scientific purist, and it was thus all the more important to maintain at a high level those activities - research - that could

(1) Christopher Kent, 'The Whittington Club: a Bohemian Experiment in Middle Class Social Reform', Victorian Studies, xviii (Sept 1974) pp.31-55.
(2) John Ella (1802-1888), the violinist and concert director, was appointed Professor of Music at the London Institution in 1871, and organised the programme of music played in the library after the lecture. This music soon became the main feature of the evening (Information from Miss J. Cutler).

serve to counter the accusation of pandering to the popular and stooping to entertain the crowd.

Chapter 5

Literary Learning and Cultivated Entertainment

The obligation to provide education and to contribute to the diffusion of useful knowledge were functions superimposed upon older and more traditional purposes of this organisation that was such an unusual combination of research laboratory, educational institution and gentleman's literary and philosophical society. The shift to entertainment noted in the preceding chapter in effect resulted in strengthening another aspect of the R.I., one which had always been present and which now needs to be further examined, namely, its role as a gentleman's literary and philosophical society. The literary and philosophical society was a particularly important element in the organisation of learning in the eighteenth century and continued to be so throughout the first half of the nineteenth century. It fostered the unity of culture. There was among its patrons no division between men of science and men of literary learning. It embraced as one and the same, learning of all types from the abstrusely scientific to the culture of classical antiquity.

During the course of the nineteenth century the role of the "lit and phil" underwent considerable change, which may be attributed to changes in the nature of society in general as well as to the rapid accumulation of learning in new and specialised fields. Such societies could not longer remain the preserve of cultured gentlemen alone, and their patrons were increasingly drawn from a wider background. Facilities for the cultivation of learned interests naturally continued to provide a major attraction, as did the role such societies played in providing a meeting place, or in acting as a type of club which offered a variety of social pleasures to their members. There was then a change in the type of person who patronised these societies; there were also changing demands brought about by these new patrons, and changing patterns of recreation. However, perhaps the most notable feature of such organisations in the years under discussion here was the close, almost inseparable nature of recreation, culture and learning. The elements can not be clearly separated in these last decades when culture and learning was still broadly speaking unified. This has much to do with the cultivated interests appropriate to a gentleman, but in the present context it has more to do with the emergence of the intelligentsia already referred to several times. The cultivation to a high level of an unexpectedly wide variety of learned interests (at least by the standards of today) was the recreation and entertainment of intelligent men and women, and, in the third quarter of the nineteenth century for an exceptionally large proportion of the educated world, cultured learning and entertainment were one and the same thing.

The essential attraction of the R.I. in this period was that it provided facilities for the cultivation of interests in all fields of learning, not in science alone. In these years people came to the R.I. precisely because it was a learned society of a general kind, and not a specialised scientific society. A considerable proportion of its activities had nothing to do with science. One of the most notable developments of the period under discussion here was a new emphasis on non-scientific subjects in the Institution's programme. Thus during the very period that saw the promotion of scientific research as the Institution's most important objective, somewhat paradoxically greater attention than ever before was paid to the purely literary side of the R.I.'s activities. It was this shift in emphasis which may arguably be held to provide the principal ingredient in the Institution's success in the 1860s. In other words, as the educational function disappeared, the Institution's role as a literary and philosophical society showed a remarkable and enduring revival. How these changes came about, and what form they took, will be the subject of this chapter.

The R.I. at one level had always been a gentleman's literary and philosophical society on the eighteenth century model, despite the innovation of conducting scientific work and research within its premises. The stated objectives of the original founders, to diffuse useful knowledge and to teach the application of science to the common purposes of life, were no less confusing with regard to the Institution's role in this respect than they were with regard to its scientific work. When the Institution discarded its proprietorial structure in 1810, it resembled a literary and philosophical society even more closely than it had done in its first decade of existence. It is salutary to remember that the major part of the Institution's sizeable building was never concerned with scientific research. Such work was confined to the basement and cellars, as indeed was considered quite normal at that time. The upkeep of the building alone cost around £1000 p.a., and even more in the 1860s, an amount which was more than double the sum spent on the laboratory.(1) The principal rooms were designed for the use of the Institution's Members, and the theatre, anterooms, library, newspaper room, reading room, mineralogical collection, together with the elegant hall and twin-branched staircase, formed one of the most imposing of literary and philosophical society buildings. The Institution had from its foundation included non-scientific learning within the compass of its activities, and for example, in the first decade of the century

(1) The largest single item in the building expenses was almost always repairs. The remainder was made up of taxes and ground-rent, insurance, the housekeeper's contract, lighting and heating expenses. After 1855, total expenses were less than £1000 in only three years, 1861 to 1863, and rose by 1870 to £1638.14.5. Until the 1860s the annual expenditure on the laboratory varied between £440 and £550 p.a., including Brande and Faraday's salaries in that figure. Tyndall's salary was always paid out of general funds, but even including his £200 (his salary in the 1850s), the sum spent on the running of the building was still very much greater (Statement of Accounts, Annual Reports, 1840-1870).

Courses of lectures were presented on such subjects as belles-lettres, music, ancient architecture and painting.[1] The 'Prospectus' of 1830 commented on the benefits to subscribers of Courses of lectures "not only in the physical Sciences and Arts of Life, but in Literature and the Fine Arts".[2] The emphasis of the Library which was run, as described earlier, in a semi-independent fashion until the late 1840s by the Library Patrons,[3] who numbered at most but one or two professional scientists among them, was again on subjects which were of general cultural interest to the educated gentleman. The 'Prospectus' of 1830 proudly described it as:

> A COPIOUS LIBRARY, richly furnished with the best authors in all languages, containing not only the important scientific works of every age, but the treasures of Ancient and Modern Literature, of Art and Antiquity ... also a reading room for the principal Modern Publications and Periodical Journals, Scientific and Literary ... (4)

In the middle decades of the nineteenth century the R.I. was still regarded as an institution of a general cultural kind, although it might indeed have a strong 'philosophical' bias. In 1843 for example, the Visitors themselves termed it a "literary and scientific society".[5] The increasing number of new specialised scientific societies founded in this period served to emphasize that even the scientific side of the Institution was itself unspecialised. Nor indeed did the R.I. regard itself as being in any way in competition either with these new specialist societies, or with the old-established scientific societies, as a letter from Barlow to W.R. Grove sometime in the 1840s makes plain:

(1) For example Samuel Taylor Coleridge gave Courses of lectures in three years between 1806 and 1808, when he asked to be excused from giving any further lectures owing to ill health (Man.Min., IV.362 (13 June 1808)); see also M. Berman, 'Introduction', Man.Min. III.
(2) 'Syllabus of Lectures' (1830), p.1 (Guard Book i.).
(3) See above, pp. 72-80.
(4) 'Syllabus of Lectures' (1830), p.1 (Guard Book i.).
(5) Annual Report (1843).

> Pray give us an evening (Discourse) next year. We don't want new matters - an evening at the R.I. is not a paper for a scientific society, if it were, it would be thrown away on us or else we should be - what I am sure you do not advise - in constant rivalry with the Royal Society for priority. (1)

Just as there were obstacles to the explicit recognition of the priority of scientific research, so were there difficulties in remoulding the accepted working definition of the literary side of the Institution from the traditional conception of the literary and philosophical society on the old model, to the increasingly non-scientific recreations of a later period. There was some confusion which may again be detected through the use of important words, as "science", "literature" and "art" began to be used in their modern senses as referring to quite separate things, as well as retaining their older and broader meanings. As already noted, the traditional phrase "men of literature and science" continued to be used in the Institution's documents throughout the century, although some slight significance might be seen in the reversal of words, so that from 1863 the phrase used was "men of science and literature".(2) The word "art" also began more often to be used as referring to the fine arts rather than to the manufacturing arts or industrial technology. The R.I., like its contemporaries in general, did not always distinguish clearly between the different meanings of such words, and for example, the 'Prospectus' of 1830 included as one of the aims of the Friday Evening Meetings "the exhibition of new objects and inventions in Science, Art, or Literature".(3) Art in such a context must refer to the manufacturing arts, but new objects and inventions in Literature might well seem a splendid flight of metaphoric fancy. On occasion literary manuscripts were certainly exhibited, but

(1) Barlow to W.R. Grove, undated (Grove MSS).
(2) 'Prospectus' (1863), p.3, section III (Guard Book iii, item 94).
(3) 'Syllabus of Lectures' (1830), p.2 (Guard Book i.).

no instance has been found when these were of recent date.(1) Sometimes a word was used in two senses within the same paragraph,.as in the 'Prospectus' of 1852. The paragraph on the afternoon Courses of lectures described them as covering "matters connected with Science or Art"; the number of Courses was then listed together with the normal subjects, the various sciences, but the final mention was to "a Course on Literature or Art".(2) It appears therefore that within the same paragraph "Art" referred both to technology and to the fine arts. Not until 1863 were the words used with rather more precision, when the term "Fine Arts" was introduced to describe that field.(3)

By the 1860s indeed many of the uncertainties had been resolved and the change in role achieved, a change which was necessitated first and foremost by the different type of person who patronised the Institution. Before discussing the main developments of the period, it is necessary to look again at the people who came to the Institution, not at those analysed in the preceding chapter who were primarily people who paid for a ticket giving them entry to certain lectures, but at those for whom the facilities of the literary and philosophical society were intended and were freely available. The people who came to the Friday Evening Meetings are therefore particularly relevant, and these were the Members and their invited guests. It is however difficult to discover exactly which Members came to the Friday Evenings and who were their guests, since no registers survive except for one fragment covering the early 1840s. This volume appears to have been used by Members to sign in their guests for the Friday Evening Discourses.(4) The majority of names were not very distinguished; the wives of Members feature prominently, as well as army and naval officers, medical men

(1) See below p. 263.
(2) 'Prospectus' (1852), p.iii. (Annual Report 1851, in 'Membership Lists' (1851-54)).
(3) 'Prospectus' (1863), p.3 (Guard Book iii, item 94).
(4) 'Ticket Book', 1841-1846.

and clergymen. This volume however covers only a very short period, and in addition is not complete for that time. For example, there are only seventeen entries for the 23rd May 1845, whereas the attendance figure recorded for that day was 255 people.(1) It is unlikely that all those not entered in the volume were Members of the Institution, as tickets were given away freely by the Secretary, and Managers and the Professors.

It is important too to distinguish between the public image of the Institution as attracting a brilliant or a fashionable audience, and the people who actually filled the seats in the lecture theatre. The R.I. always managed to retain a reputation as the resort of fashionable upper-class society, besides attracting the best scientific intellects, at least where the Friday Evening Discourses were concerned. However, the people who contributed in large measure to the formation of this image were the scientific men themselves, and their evidence warrants some critical attention. Those who were most impressed by the brilliance and lustre of the audience prove to have been men who were either young and at the beginning of their careers, or men who came from the provinces, or both. The geologist, Arthur Crombie Ramsay (1814-1891), is a good example. Ramsay was the son of a Glasgow manufacturing chemist, and came to London in 1841 to join the Geological Survey. A few years later he described the audience for his own Discourse in glowing terms:

> At nine I was introduced, the Duke of Northumberland in the chair, the French Ambassador on his right, Mr. Hamilton on his left, and in the front row were Lord Overstone, Sir John and Lady Herschel, Wheatstone, Faraday, Murchison, etc. etc. It was literally a brilliant audience, with many ladies. (2)

Admittedly such a group was not to be scorned, but with the exception

(1) Ibid., entries for 23 May 1845; 'Index to Lectures' (1842-1965), p.22.
(2) Geikie, Ramsay, p.159. For Hamilton and Wheatstone, see above, pp. 33, 51; for Murchison and Overstone, see Appendix II.i, iii; for Sir John Herschel (1792-1871), the astronomer, see D.N.B.

of the French ambassador, all those mentioned were either scientific men or Managers and officers of the Institution. So often the people spoken of with awe and admiration were from the London scientific world. This was still true a decade later in 1860, as shown by a comment of William Pengelly (1812-1894), the Devonshire geologist: "The audience contained a good number of truly great men - Babbage, Faraday, Murchison (in the chair), Tyndall, Grove, Bigsby, Daubeny, Wheatstone and others".(1) Faraday and Tyndall were naturally present; Murchison, Grove, Bigsby and Wheatstone were all London scientific men, and in addition were Managers of the R.I.;(2) Charles Babbage (1792-1871), the mathematician and inventor, was an old friend of Faraday, and only Charles Daubeny (1795-1867), also well-known to Faraday, came from outside London.(3) In the 1840s in particular, it is rare to find the names of people who were well-known outside scientific circles or who were unconnected with the Institution. Indeed, as Ramsay's biographer noted, in the 1840s the R.I. seems to have been a favourite meeting place for geologists: "The Friday evening discourses of the Royal Institution, and the receptions of its genial Secretary thereafter, formed additional favourite gathering places".(4) Gideon Mantell (1790-1852), a witty medical man turned geologist, scoffed at the assemblage of "fashionable lady and gentleman science-fanciers" to be found at the R.I., but although not a Member himself, he was in the habit of attending five or six Friday Evening Discourses each season, and often mentioned how many friends and acquaintances he met, many of whom like himself were geologists or medical men.(5) One may turn to Ramsay again for a description which

(1) William Pengelly to his wife, 20 May 1860, cited in Hester Pengelly (ed.), <u>A Memoir of William Pengelly</u> (1897), p.97.
(2) See Appendix II.ii. for Bigsby.
(3) See <u>D.N.B.</u> for both men.
(4) Geikie, <u>Ramsay</u>, p.159.
(5) Curwen, <u>op.cit.</u>, p.265, and <u>passim</u>. Mantell was an inveterate attender of learned society meetings, although he promised himself to forswear "all enjoyments of this kind" on account of his health (<u>ibid.</u>, p.184).

gives both the authentic flavour of a Friday Evening, and also reveals clearly the type of audience which normally filled the theatre in the 1840s, when he attended a Discourse by the celebrated comparative anatomist, Richard Owen:

> The theatre was quite full. I saw many I knew: Dr. Fitton looking good-humoured, Sir Roderick looking anxious to keep awake, Dr. Mantell looking eager, Dr. Macdonald looking jolly and anxious for a hole in Owen's coat, Sir Henry looking attentive and queer when Owen came to the orthodox peroration, Sir Charles and Lady Lyell looking knightly, Lady S— looking vulgar, Nicol looking Scotch, with a doubt in his eye, and Mrs. F— looking at her dress.(1)

Apart from the ladies, all those mentioned were once again geological or medical men. There is however enough evidence to support the assertion that from the late 1850s and early 1860s a greater variety of people came to the Institution. On the one hand there were more people of recognised intellectual stature, but there were also people from a wider range of social backgrounds, from the relatively humble upwards. Such developments would naturally reflect the changes that occurred in the membership referred to earlier. In the 1860s and 1870s there were more references to what a "ticklish audience" one found at the R.I.,(2) suggesting that the extremes of knowledge and ignorance were wider than before. A substantial, and possibly even larger portion than before, of the audience were women. B.H. Becker, author of a guide to Scientific London in 1874 commented on the "wonderful combination of science and society, of physics and fashion", and spent much space describing the predominance of "the British matron" and all the variety of the latest

(1) Geikie, Ramsay, p.145. Dr. W.H. Fitton (1780-1861), a well-known geologist; Sir Roderick almost certainly refers to Murchison; Dr. Gideon Mantell, geologist, mentioned above, p.231; Sir Henry probably refers to Sir Henry de la Beche (1796-1855), Director-General of the Geological Survey and Ramsay's superior there; Sir Charles Lyell (1797-1875), eminent geologist; James Nicol (1810-1879), from 1853 Professor of Natural History at Aberdeen; see D.N.B. on all those named. Only Macdonald has not been definitely identified any further.

(2) A.C. Ramsay to A. Geikie, no date given, but probably sometime in the 1870s (Geikie, Ramsay, p.98).

feminine fashions, with "gay opera cloaks and Angot caps".(1) In his gossipy memoirs, Henry Roscoe (1833-1915), Professor of Chemistry at Owen's College, Manchester, went out of his way to tell no less than four anecdotes concerning the stupidity of young ladies at R.I. Discourses.(2) One wonders whether attendance at an R.I. Discourse, perhaps only during the 1870s and 1880s, became a must on the season's calendar for a young lady coming out in society, as occurred with such events as the opening of the Summer Exhibition at the Royal Academy.(3)

Nonetheless, there was also a more prominent intellectual element than before, as Frankland himself commented that the R.I. attracted at this time "a general audience of intellectual people".(4) Many of these people too were women, a feature which may be attributed to the increased popularity of serious interests for ladies which was very marked in the 1860s, and exemplified at the R.I. by the many wives of scientists who attended lectures. The ticket books for afternoon Courses contain the names of the wives of Hensleigh Wedgwood, George Busk, Bence Jones, J.H. Gladstone, Sir Charles Lyell, Charles Wheatstone, and J.D. Hooker, to name but a few.(5) Geraldine Jewsbury (1812-1880), the authoress and close friend of the Carlyles, was a devotee of R.I. lectures, and in the 1860s wrote every year to the Secretary for a free ticket. She asserted that the Friday Evenings were too crushed, and therefore frequently attended afternoon lectures.(6)

Moreover, Tyndall no doubt contributed to attracting many new

(1) Becker, op.cit., pp.44, 45-6.
(2) Roscoe, op.cit., pp.139-40. J.S. Blackie, the Scottish Professor and man of letters, also noted in 1867 that the afternoon lectures too were attended by "a large proportion of the fair sex" (A.S. Walker (ed.), The Letters of J.S. Blackie to his Wife (1910), p.157).
(3) As described by Davidoff, op.cit., p.27.
(4) Frankland, op.cit., p.136.
(5) 'Subscribers to Lectures', ii.iii, passim. Many of those names took a general ticket for all Courses of Lectures, not merely for the occasional single Course.
(6) Geraldine Jewsbury to Tyndall, 7 June 1856, 22 Jan 1862, and 17 Feb 1863 (Tyndall, Correspondence, 14/E12.1-3).

people to the R.I. at this period, the 1860s and early 1870s. In contrast to Faraday who led a secluded social life, Tyndall led an active life among the intellectual elite that became so important at this time. As his friend, T.A. Hirst, the mathematician, noted, "his company is greatly sought I believe for his conversational powers", and Tyndall was "obliged to dine out incessantly".(1) Tyndall was a favourite for example with the Ashburtons, whose circle included many eminent men from politics and the arts. There are many references in Tyndall's journals to invitations from the Ashburtons, and his correspondence contains five letters from Lord Ashburton concerning educational matters, and twenty-seven letters from Lady Ashburton regarding dinner invitations, visits, books and the Friday Evening Discourses.(2) Tyndall was the friend too of men such as Thomas Carlyle and Alfred Tennyson, and of A.P. Stanley, the Dean of Westminster, all of whom attended Friday Evening Discourses.(3) In the 1840s the audience was almost void of any notable literary name, whereas from the 1860s onwards it is not unusual to find men such as Milman, Lecky or Froude mentioned from time to time.(4) They all belonged to the same circle, and Lecky apparently "keenly enjoyed Huxley and Tyndall's admirable expositions";(5) like Tyndall, Froude was another close friend of Carlyle, whose literary

(1) Hirst Journal, III.9 (6 Nov 1859), IV.640 (5 July 1863).
(2) Tyndall, Correspondence, 5/F4.1-5, 5/F5-9.1-27. William Bingham Baring, 2nd Baron Ashburton (1799-1864), also served as a Manager three times between 1854 and 1860 (see Appendix II.ii).
(3) Tyndall got to know Carlyle in 1855 and Tennyson in 1858. Dean Stanley conducted the marriage ceremony of Tyndall and Louisa Hamilton in 1876, and had been well known to Tyndall for the preceding decade since their correspondence in 1866 over prayers for deliverance from the cattle plague. Stanley and his wife bought tickets on occasion for afternoon Courses of lectures, as in 1870 to hear Max Müller "On the Science of Religion" ('Subscribers to Lectures', iii.117).
(4) The name of Milman, writer, playwright and Dean of St. Paul's, crops up from time to time in contemporary journals, for example when he attended J.P. Lacaita's Course in 1857 "On Italian Literature" (Journal of Lacaita, 26 May 1857, quoted in C. Lacaita, An Italian Englishman (1933), p.81).
(5) Memoir of W.E.H. Lecky, by his wife (1909), p.91.

executor he became. The presence of such men may be partly accounted for by the fact that in the 1840s there were few notable speakers on literary subjects, whereas in the 1860s it was natural that notable men of letters came to listen to other notable men in their field. Furthermore, while Bence Jones sought to ensure that the Institution presented distinguished men as speakers, he also endeavoured to make sure that the audience was equally distinguished, and his correspondence records that he accompanied himself or sent tickets for Discourses to many notable men, including writers, poets, cardinals, bishops, scholars, political men, travellers and explorers.(1) William Ewart Gladstone himself was even apparently asked to give a Discourse, an invitation to which he responded with his habitual circumlocution: "He will reflect upon it: but he fears the result will be that he will find he has not sufficient daring".(2) But in the late 1850s and the 1860s he appears to have enjoyed attending lectures at the Institution, together with other political figures of such different generations as Lord John Russell and G.J. Goschen.(3) Purely literary subjects naturally attracted their own audience of people with a special interest, as A.J. Munby, the poet, vividly recorded when W.R.S. Ralston gave a Discourse on Russian folklore:

> Tourguenef was there, a tall large man with white hair and heavy features, pleasant of countenance; Lord Houghton, ill-favoured and obese ... George Macdonald, with shaggy locks and plaid ... (4)

(1) Bence Jones papers (in Messrs. Sotheby's hands).
(2) J.A. Godley (on behalf of W.E. Gladstone) to W. Spottiswoode, 22 Feb 1874 (Tyndall, Correspondence, 20/B5.1).
(3) On this occasion the Discourse was given by Tyndall, "On Radiation and Absorption, with reference to the Colour of Bodies, and their State of Aggregation" (Tyndall, Journal VIIIa, p.357 (19 Jan 1866)). Gladstone also attended some of the lectures in Lacaita's Course on Italian Literature in 1857 (C. Lacaita, op.cit., p.81); Lacaita was already known to Gladstone, and became the secretary of Gladstone's mission to the Ionian Islands in 1858 (D.N.B., entry for Sir James Philip Lacaita). On another occasion Gladstone attended a Discourse in 1867 given by J.S. Blackie(Walker, op.cit., p.156).
(4) Diary of A.J. Munby, 5 May 1871, cited in D. Hudson, Munby, Man of Two Worlds: the Life and Diaries of Arthur J. Munby, 1828-1910 (1972),

Turgenev, the Russian novelist, also appears to have taken an interest temporarily in physical science, as he purchased a ticket to Tyndall's afternoon Course of lectures "On Sound" in 1871.(1) Indeed the theatre on occasion must have presented a colourful and cosmopolitan scene, with Russian novelist alongside Greek banker, eminent prelate next to county lady in London for the season, literary dilettante, medical man, African traveller and Portuguese wine-merchant all crowded together on the narrow seats.(2)

Such people would not have been attracted to the R.I. if it had been a purely scientific society, however expert and exciting its lectures. So long too as many of the Institution's Managers, men such as W.F. Pollock, William Spottiswoode or Sir John Lubbock, were themselves part of the intelligentsia of the period, the R.I. could cater confidently for such tastes. In the 1860s it did this supremely successfully because there was not yet a separation of men of science from men of culture and learning, and because the particular interests of the intelligentsia in this period could be well satisfied by just such an organisation as the R.I. Two developments in this decade are therefore of especial significance. Firstly there was a new emphasis in the lecture programme on non-scientific subjects and topics from the arts and literature, and secondly, the R.I. made the striking innovation of presenting to its listeners the new learning of the period, in particular the human and social sciences, and not only that of the natural sciences.

From 1861 the number of Friday Evening Discourses on non-scientific subjects increased sharply, so that by the mid-1860s they accounted for

p.296. W.R.S. Ralston (1828-1889), Russian scholar; Richard Monckton-Milnes, 1st Baron Houghton (1809-1885), politician and litterateur; George Macdonald (1824-1905), poet and novelist; see D.N.B. for all three men.

(1) 'Subscribers to Lectures', iii.150.

(2) Ibid.; the ticket following Turgenev's was bought by A. Ralli, of the family of Greek merchants and bankers. A number of the business-men who joined the R.I. in this period had Peninsular connections, such as the Sandemans and the Perez Lozano.

between a quarter and a third of the total. In the 1840s there had been only fourteen non-scientific Discourses altogether, while the figure for the decade of the 1860s trebled to forty-three. Likewise from 1862 there was also an increased number of non-scientific afternoon Courses of lectures, which numbered by the mid-1870s five or six each season. Furthermore, the type of non-scientific subject was very different from that presented in the 1840s. At that time a non-scientific Discourse would deal with architecture, Egyptian or classical antiquities, or travel. Typical examples were George Catlin's Discourse "An Account of his residence and adventures among the native tribes of North America, their social condition, customs, mysteries, mode of warfare" (1840); or Samuel Birch "On the Hieroglyphics of the Egyptians" (1841) and "On Graeco-Italian vases" (1842); or the Rev. Robert Willis "On the gradual development of the plan of a mediaeval church considered historically" (1846).(1) In the 1840s afternoon Courses too invariably covered music, architecture, or some aspect of the arts such as painting, wood engraving or sculpture. These topics did not entirely disappear, but they occurred less frequently as time went on. The 1860s present a marked contrast. Entirely new subjects appeared on the programme for the first time, such as history, English literature, the history of art, philosophy, and the classics as opposed to classical antiquities. Discourses were to be heard on such subjects as "The Science of History" by J.A. Froude (1864), "The Influence of Arabic Philosophy in medieval Europe" by Lord Stanhope (1866), "The Music of Speech in the Greek and Latin languages" by J.S. Blackie (1867), "Portraiture: its Fallacies and Curiosities as connected with English History" by George Scharf

(1) George Catlin (1796-1872), the American who became famous for his paintings and writings on the North American Indians (see M.C. Roehm, The Letters of George Catlin and his Family (1966)); Samuel Birch (1813-1885), Egyptologist and keeper in the British Museum; Rev. Robert Willis (1800-1875), Jacksonian Professor of applied mechanics, Cambridge, and an authority on architecture (D.N.B.).

(1865), or "Rousseau's Influence on European Thought" by John Morley (1872).(1) Equally, the afternoon Courses of lectures covered such previously untouched topics as European history and literature, the theories of recent philosophers, Roman history and archaeology, and the work of musical composers. A few examples are J.P. Lacaita's Courses of lectures in 1857, 1858 and 1859 on Italian history and literature; J.R. Seeley gave three Courses between 1869 and 1874 on various aspects of Roman, English and European history; David Masson gave a Course on "Recent British Philosophy" in 1865, and George Croom Robertson on "Kant's Critical Philosophy" in 1874.(2) Courses on music were given by such well-established figures as John Hullah, Henry Chorley and G.A. Macfarren, as well as by younger men such as Edward Dannreuther, pianist and founder in 1872 of the Wagner Society.(3)

Moreover, the calibre of the speakers both in Friday Evening Discourses and in afternoon Courses of lectures was markedly higher under Bence Jones' administration. Many of the outstanding figures in literary and intellectual life were to be found speaking in the Institution's theatre, such as Benjamin Jowett, the renowned master of Balliol and Regius Professor of Greek; John Ruskin, controversial art historian and social critic; Charles Kingsley, Christian socialist and popular author;

(1) J.A. Froude (1818-1894), historian; Philip Henry, 5th Earl Stanhope (1805-1875), historian and President of the Society of Antiquaries from 1846 to his death; J.S. Blackie (1809-1895), man of letters and Professor of Greek at Edinburgh; George Scharf (1820-1895), writer on art and first director of the National Portrait Gallery; John Morley (1838-1923), author, literary editor and future Liberal M.P. See <u>D.N.B.</u> on all five men. Their Discourses may be found in <u>P.R.I.</u>, iv-vi.

(2) J.P. Lacaita, see above p.235 n.3; J.R. Seeley (1834-1895), Professor of modern history, Cambridge; David Masson (1822-1901), from 1863 Professor of Rhetoric and English Literature at Edinburgh; George Croom Robertson (1842-1892), Professor of mental philosophy and logic at University College, London. See <u>D.N.B.</u> on all four men.

(3) John Hullah (1812-1884), composer and teacher; Henry Chorley (1808-1872), music critic of the <u>Athenaeum</u>; G.A. Macfarren (1813-1887), composer, see <u>D.N.B.</u> On Edward Dannreuther (1844-1905) see <u>Baker's Biographical Dictionary of Musicians</u> (rev. Alfred Remy, 1919), p.190.

John Morley the future biographer of Gladstone, who was at that time the editor of the Fortnightly Review, a notable forum for progressive opinion.(1) There were others too who were invited, but refused for lack of time (or inclination), such as Matthew Arnold, poet and critic, or Frederick Temple, the future Archbishop of Canterbury.(2) However, the Rev. F.W. Farrar, editor of Essays on a Liberal Education, gave Discourses in 1867 and 1868 on the deficiencies of public school education.(3) Mention of such men shows the efforts that Bence Jones for one made to attract to the R.I. those advocates of a liberal education who wished to see science included in a reformed programme of liberal studies, but rejected an education based solely on science as sterile and arid. In his day the R.I. was indeed itself a place where the best of that liberal culture and learning could be found.

The second main development of the period was the R.I.'s significant innovation of introducing into its programme the new learning of the period, notably the new sciences of man - philology, ethnology, anthropology, archaeology and sociology - subjects which were only then beginning to deserve the name of science and to be pursued by professionals as well as amateurs. Some of these sciences had indeed supported their own learned societies from the 1840s, for example the Philological and Ethnological Societies and the Archeological Association, but besides providing serious discussion of these subjects, they also provided a haven for "cranks and exhibitionists of every description".(4) From the 1860s however, the human sciences began to make rapid progress, and

(1) Benjamin Jowett (1813-1893) gave an afternoon Course on "Socrates" in 1871; John Ruskin (1819-1900) gave five Discourses between 1861 and 1870; Charles Kingsley (1819-1875) gave two afternoon Courses in 1866 and 1867; John Morley gave a Discourse in 1872 and an afternoon Course in 1873. See D.N.B. on all four men.
(2) Matthew Arnold (1822-1888); Frederick Temple (1821-1902), see D.N.B.
(3) Rev. F.W. Farrar (1831-1903), author, philologist and future Dean of Westminster (D.N.B.).
(4) J.W. Burrow, Evolution and Society, p.128, when referring to the Anthropological Society, founded in 1863 by several leading members of the Ethnological Society.

from being subjects on the fringe of learning proper, they began to become professionalised, with all that professionalization entailed, such as for instance the establishment of chairs in universities.(1) In this decade therefore such subjects held great interest to intelligent men and women as new, systemmatic and superior learning, but learning which was not yet restricted to the arcane circle of professional specialists. Indeed, the fields covered by new and apparently specialised learned societies were by no means always exclusive; for example, the Royal Historical Society, founded in 1868, listed its purposes as the "conducting of Historical, Biographical and Ethnological investigations".(2) However, as such subjects became truly learned and specialised, they had for the first time to be explained and in effect popularised before an amateur audience. The R.I. was an important agent in this popularisation, and outside the specialist societies, in the 1860s it was the only place where such subjects were not only discussed, but expounded by the foremost people in the field. They were by contrast totally absent from the London Institution for example. These topics too were not merely reserved for the occasional Friday Evening Discourse. Once again, it appears that it was due to Bence Jones that F. Max Müller, the most important comparative philologist in England, was invited to give his well-known Course of nine lectures on the "Science of Language" in 1861.(3) These lectures were the first popular presentation of the methods of comparative philology, and

(1) For example, in 1868 the Professorship of Comparative Philology was established at Oxford; in 1851 John Disney (1779-1857) founded a Professorship of archeology at Cambridge, but it was not until the 1880s that classical archeology at the two ancient universities was put on a firmer footing.

(2) R.A. Humphreys, The Royal Historical Society, 1868-1968 (1969), p.3.

(3) F. Max Müller (1823-1900), D.N.B. The Managers' Minutes state that Bence Jones was requested to arrange these lectures with Max Müller. The unusual phrasing, and the timing - before Bence Jones was elected Secretary - suggests that the proposal had come from him (Man.Min., XI.339 (18 June 1860)).

aroused so much interest that they were promptly printed and the Course repeated two years later in 1863.(1) Max Müller again gave afternoon Courses in 1870 and 1873 and the occasional Discourse.(2) Sir John Lubbock described in a Discourse in 1863 his pioneer anthropological study "On the Ancient Lake Habitations of Switzerland", and also gave afternoon Courses in 1864 "On the Antiquity of Man", and in 1868 "On Savages".(3) At the same time invitations were given to the geologists whose researches gave vital evidence for dating the antiquity of man, thus providing the basis for debates on evolutionary anthropology which occupied considerable attention in the 1860s. The most notable of these were Joseph Prestwich, who gave a Discourse in 1864 "On the Quaternary Flint Implements of Abbeville, Amiens, Horne, etc. and their Geological position and History", and William Pengelly, who gave afternoon Courses in 1861, 1867 and 1871, and Friday Evening Discourses in 1859, 1860, 1865 and 1867.(4) T.H. Huxley, who made periodic forays into those fields in the 1860s, was elected Fullerian Professor of Physiology in 1866, and turned his Course of twelve lectures into a series on Ethnology.(5) E.B. Tylor, perhaps the most important of the early anthropologists, gave Discourses in 1867 and 1869, at the very beginning of his career, and an afternoon Course in 1872.(6) In the

(1) See Burrow, Evolution and Society, pp.149-50. F.W. Farrar also gave an afternoon Course in 1869 on the "Growth and Results of Comparative Philology".

(2) The subjects of his Courses were "The Science of Religion" (1870) and "Mr. Darwin's Philosophy of Language" (1873). He gave three Discourses between 1863 and 1870, and continued to give the occasional Discourse after that time.

(3) For his Discourse see P.R.I., iv (1862-66), pp.29-40. Syllabuses for the afternoon Courses, and for all the other Courses mentioned in this paragraph, may be found in Guard Book, iii.

(4) Joseph Prestwich (1812-1896), and William Pengelly (1812-1894), see D.N.B. See also Burrow, op.cit., pp.115-6.

(5) In contrast to the crowds who listened to Huxley's Discourses, attendance at this afternoon Course was poor, attracting only an average of 155 people in 1866 and 136 in 1867, which must have been the smallest audiences Huxley ever lectured to at this period ('Index to Lectures' (1841-1912), pp.147, 152).

(6) E.B. Tylor (1832-1917), D.N.B. See Burrow, op.cit., pp.234-59 for a discussion of the importance of his work.

early 1870s he was joined by another notable ethnologist, Colonel Augustus Lane-Fox, who joined the R.I. as a Member in 1872, and gave his first Discourse there in 1875.(1)

Admittedly, one should not over-estimate the importance of the human sciences in the whole programme of the R.I. Nonetheless they were undoubtedly an innovation, and an extremely attractive one to people at that time. The journals and reminiscences of such men as T.A. Hirst, the mathematician, and W.F. Pollock record their deep interest in such topics.(2) Müller's Courses of lectures were among the most popular ever given at the R.I. In 1861 average attendance at each lecture was 257 people, already a good figure, but by 1870 the number was as high as 401, an exceptional number for an afternoon Course.(3) Such subjects were the delight of the intelligentsia, and played no small part in raising the reputation of the R.I. as the home of a wide range of higher learning.

Through the other facilities provided by the R.I. one may trace the same concern for a breadth of learning which ranged far beyond the experimental sciences. The Library was the most important of the other facilities, for in any cultural institution, a library was an important, indeed often the vital element in attracting public support. The battle for control over the Library's management has already been discussed, and it is the contents of the Library and its development after the struggles of 1847 to 1849 that is of interest here. For the following two decades, both Patrons of the Library and the Managers separately

(1) Colonel Augustus Lane-Fox, assumed the name Pitt-Rivers (1827-1900), D.N.B.
(2) Hirst Journal, III.1577 (28 April 1861); Pollock, op.cit., ii.112. In the early 1860s Pollock's memoirs contain periodic mention of these topics and the names of the chief men associated with them, such as Prestwich (ii.93-4), Sir Charles Lyell, whose important work The Antiquity of Man (1863) Pollock reviewed for Fraser's Magazine (ii.105), and T.H. Huxley (ii.105, 109-10).
(3) 'Index to Lectures' (1841-1912), pp.122, 165.

purchased books for the Library. This duplication of function provides some of the most revealing evidence of the different views of the type of institution it was felt the R.I. should be, remembering too that the years at the end of the 1840s were those that saw the reassessment of the functions of the laboratory, which ended in the departure of B.C. Brodie.[1] The position of the Library was equally important. When the Managers first became directly involved in the late 1840s, they found it to be a gentleman's library covering the principal departments of learning. Science formed one of these departments, but was of no other especial importance. It is evident too that the Managers were concerned that there had been a decline in the quality of the Library as a whole, as the Visitors had roundly stated in their Annual Report of 1846, and that the scientific section in particular had suffered.[2] The insurance on the Library was reduced from £10,000 to £6,500 following a fresh valuation in July 1848.[3] For three years between 1848 and 1851 the Managers as a whole were involved in all the many details of the Library's management, until the managerial Library Committee was appointed. In March 1849 the Managers stated their intentions clearly:

> that inasmuch as the character of the Royal Institution has been established by scientific research, it is most important to make the scientific department of the Library as complete as possible. (4)

To remedy its defects, the Managers ordered the immediate purchase of twenty-two scientific works, and the journals of three scientific societies.[5] There was an unusual flurry of activity: scientific periodicals were listed, incomplete series completed where possible, unwanted periodicals and newspapers weeded out, additional ones

(1) See above, pp.141-8.
(2) Annual Report (1864), cited above,p.75.
(3) Man.Min., X.128 (10 July 1848), 157 (5 Feb 1849).
(4) _Ibid._, X.170 (19 Mar 1849).
(5) _Ibid._, X.170-1 (19 Mar 1849).

subscribed to and many new books purchased.[1] Thereafter the Library rapidly increased in size from around 24,000 volumes in 1851, reaching some 36,000 volumes by 1870.

Science was certainly well catered for in this increase, and furthermore, after 1851 the R.I. benefited greatly from the exchange of its Proceedings with those of other learned societies. It is however necessary to examine more closely the purchases of both Managers and Patrons during the long period when both were purchasing books. For it is clear on investigation that there was little intention to create a scientific library, but rather to maintain a general library of high quality in all the major fields of learning. In such a library learned interests which had nothing at all to do with science could be happily pursued. If the Discourses and the afternoon lectures were tailored for the appreciation of cultivated men from all fields of knowledge, so too was the Library.

The Patrons, as was to be expected, in any event concentrated on non-scientific works for the bulk of their purchases. Literary works, history, antiquities, local history and topography, architecture, and travel formed the majority, with only the occasional purchase of a work on geology, or an atlas, or a treatise on applied science. For example, their thirty purchases in 1851 form such a typical and revealing selection that they merit listing in full:

(1) For example, ibid., X.98-100, 106-7, 196-7, 235 (22 May and 5 June 1848, 18 June 1849, 4 Feb 1850).

Books Purchased by the Patrons of the Library - 1851(1)

			(Price)		
April	Description de l'Egypte, 9 vols. & 12 vols Plates	fol°	50.	..	..
May	Carter's Cambridgeshire	8°		5	
	Wyndham's Wiltshire	8°		5	
	Price, Leominster	8°		4	
	Loder, Hist. of Framlingham	4°		15	
	Peshall, State of Oxford	4°		12	
	Price, Salisbury Cathedral	4°		9	
	Phillips' Hist. of Shrewsbury	4°		9	6
	Anquetil, Esprit de Ligue	3 vol.12°		4	6
	Harris, History of Kent	fol°		18	
	Cooper, Life of Sir A. Cooper	2 vol. 8°		7	6
	Southey, Sir T. More, or Colloquies	2 vols.8°		12	.
Oct.	Seroux D'Agincourt, Hist. de l'Art par Monumens.	3 vols.fol.	9	10	..
	Athenas, ed Schweighauser	14 vols.8°	2	12	..
	Ray, Historia Plantarum	3 vol.fol.		15	
	Mendham, Hist. of Council of Trent	8°		9	
	Nichols, Collection of Autographs	fol°		12	
	Condorcet, Vie de Voltaire	8°		3	
	Creuzer, Religions d'Antiquite par Guignant - tome. 2, 3. Do. Atlas	8°	3	..	6
	Anquetil, Hist. de France	5 vol. 8°	2	5	0
	Barante, Hist. de Ducs de Bourgogne	12 vol 8°	2	8	..
	Memoires de l'Academie de Belles Lettres- tome, 16, 17 & 18. part 2.	4to	4	....	
Nov.	Ihre, Sueo. Gothicum Lexicon	fol	2	16	-
	Polwhele, Biog.c Sketches of Cornwall	3 vol 12°		7	
	Las Cases, Journals of Napoleon	4 vol. 8°		14	
	Kenrick, Ancient Egypt	2 vol. 8°	1	5	6
	Phillip's Memoir of W. Smith	8°°		6	6
	Fortune's Wanderings in China	8vo		12	9
	Jackson's Hist. of Lichfield	8°		2	6
	Clinton's, Fasti Romani	2 vol. 4°	2	19	
			£91	..	3

£50, or more than half the total spent for the whole year, was devoted to one of those richly illustrated works on antiquities which were so highly prized in the nineteenth century. Nearly a third of the total was accounted for by works of local history and topography. The most expensive single works, apart from the Description de l'Egypte, were

(1) 'Books purchased by the Patrons' (1851-1864), pp.1-2.

those in the French or German languages and concerned history or belles lettres. Only three volumes, the life of Sir Astley Cooper, the famous physician, the Historia Plantarum, and the memoir of William Smith, the geologist, had any connection with science. The intention of the Patrons appears to have been to provide solely for the tastes of cultured connoisseurs. A decade later in 1861 the Patrons' approach to purchases was still very similar. The amount of money at their disposal was smaller, but out of their £39.4.6. they managed to purchase thirty-one volumes.(1) It is true that by this date works on antiquities formed a less marked feature, but nevertheless the majority of books purchased were works on history, travel, architecture and topography. Two works on education were also purchased, by Senior and Arnold, suggesting that on occasion the Patrons too were touched by concern for contemporary problems, but such works were not usually found in the Patrons' list. Out of the total of thirty-one books purchased, only three concerned science, namely "Bewick's Geology of Cleveland", "Agassiz, Contributions to Nat[l] History", and "Buston, Glossary of Mineralogy", and to stretch a point, one might also include two volumes on economic geology, "Hull's Coal-Fields" and "Holland's Fossil Fuel".(2) But the reader's scientific knowledge would hardly be overstrained.

It is at first sight more surprising to find that there was equally no neglect among the Managers of the non-scientific section of the Library. In 1848 one might indeed expect to find a man such as the Rev. John Barlow purchasing works by Schiller, or the complete works of Voltaire in one hundred volumes.(3) But it is significant that the attractions of the Library as set out in the new 'Prospectus' of 1851 (which listed scientific research as the Institution's first objective) should emphasize

(1) Ibid., entries for the year 1861 (the later pages of this volume are not paginated).
(2) Ibid., (1861).
(3) Man.Min., X.107, 111 (5 and 19 June 1848).

far more its non-scientific than its scientific character:

> A LIBRARY of nearly 24,000 Volumes, including the best Authors in the Latin and Greek Languages, - the writings of the ancient Fathers of the Church, - English County Histories, - Works of Science and Literature, of Art and Antiquarian Research, - the Transactions of the principal British and Foreign Academies and Scientific Institutions, as well as an extensive collection of Historical and Miscellaneous Tracts. (1)

One may suggest too that the insertion from 1854 into this 'Prospectus' of the announcement that "A CIRCULATING LIBRARY is subscribed to in order to afford the Members an opportunity of seeing the Newest Books as soon as published", also emphasized the more purely literary attractions of the Library.(2) The circulating library in question was Mudie's, the largest and most important, and presumably Members then had access to works of fiction as well as non-fiction.(3) Works in all fields except modern fiction continued to be purchased by the Managers. The balance of the Library's contents may be clearly seen in the new catalogue drawn up a few years later in 1857. This catalogue, compiled by Benjamin Vincent, is itself of particular interest, chiefly on account of the classification of subjects adopted. The contents of the Library were divided into seven principal classes, divided into numerous sections and sub-sections. The importance of each class may be broadly estimated by the number of pages devoted to it in the catalogue, as unfortunately the volumes themselves are not numbered. The classes were listed as follows:

(1) 'Prospectus' (1851), p.iv (Annual Report 1851, in 'Membership Lists' (1851-54)).
(2) 'Prospectus' (1854), p.v (Annual Report 1853, in 'Membership Lists' (1851-54)).
(3) A circulating library had been subscribed to in the preceding years, but in 1853 the subscription was changed to Mudie's (Man.Min., X.427 (7 Mar 1853)).

I. Theology (pages (1-59)
II. Government, Politics, Jurisprudence, and Commerce (pages 60-95)
III. Sciences and Arts (pages 96-301)
IV. Literature (pages 302-443)
V. Geography (pages 444-495)
VI. History, Mythology, Archaeology and Biography (pages 496-597)
VII. British Geography, Antiquities, History and Biography (pages 598-820) (1)

The separation of the substantial section of works on Britain from works of the same type on other countries, was not perhaps surprising and may signify a patriotic element in the classification, but more interesting in the present context is the fact that barely one quarter of the Library was devoted to Class III, Sciences and Arts, a rather small proportion for an institution that was becoming more concerned than ever to assert its scientific status. Furthermore, a closer examination of this class serves to illustrate once more how broad and inclusive a category science and art could still be in this middle decade of the nineteenth century. There were seventeen sections, each in turn further subdivided. Five of this number concerned science proper: "Natural History", Natural and Experimental Philosophy", "Chemistry", "Mathematical Sciences" and "Astronomy".(2) The category "Miscellaneous" was also chiefly scientific, containing the transactions of learned societies, scientific journals and encyclopaedias.(3) A further six sections concerned science-related subjects: "The Medical Sciences", "Architecture", "Civil Engineering", "Navigation and Naval Architecture", "Mechanic Arts" and "Military Art".(4) The remaining sections were "Moral and Intellectual Philosophy" (which included

(1) Catalogue of the Library of the Royal Institution of Great Britain (1857), "Synopsis", pp.vii-xvii (hereafter cited as Library Catalogue (1857)).
(2) Ibid., pp.x-xi.
(3) Ibid., p.xii.
(4) Ibid., pp.ix, xi-xii; "Military Art" is included here as it was concerned with subjects such as gunnery and fortifications, as well as with strategy and tactics.

"Education" and "Daemonology, Witchcraft &c." as well as "Moral Philosophy" and "Ethics"), "Fine Arts", "Music", "Sports and Games" and finally "Domestic Economy".(1) It seems that Sciences and Arts included any subject that did not clearly fit elsewhere, and a broader interpretation of the term would be difficult to find anywhere.

Classes IV, V and VI may be described briefly. "Literature" included sections on "Bibliography" and "Language", but had a large section on "Classical Literature" and also on European literature.(2) Oddly, works of English literature were included here rather than in the British class. There were also a number of works of Oriental literature, and the R.I. continued to subscribe for the volumes printed by the Oriental Translation Fund.(3) Class V, "Geography" consisted largely of "Voyages and Travels", and Class VI primarily of "History".(4) Thus, the Library in the mid-nineteenth century still followed the eighteenth century pattern of a gentleman's library catering for a broad range of interests. The Egyptologist, the orientalist, the classical scholar, the literary dilettanti and the gentleman-antiquary would all feel equally at ease there.

The continuity of tradition is revealed all the more strongly when a comparison is made with the earliest catalogue of the R.I. Library, that compiled by William Harris in 1809. The classes adopted by Harris were as follows:

I. Theology
II. Jurisprudence, Government, and Politics
III. Sciences and the Arts
IV. Belles Lettres
V. History
VI. British History (5)

(1) Ibid., pp.ix, xii.
(2) Ibid., pp.xii-xiii.
(3) Ibid., p.xiii.
(4) Ibid., pp.xiv-xvi.
(5) Catalogue of the Library of the Royal Institution of Great Britain (1809), "Synoptical Table of Contents", pp.ix-xv (hereafter cited as Library Catalogue (1809)).

In 1857 therefore Vincent maintained a classification adopted nearly fifty years earlier. The only major change he made was to divide Class V, "History", into two, separating geography from history and archeology in his Classes V and VI. Furthermore, Vincent left unchanged most of the sections, adding new ones where necessary and shifting some sub-sections to other sections. Where he did make changes, many of these were to Class III, "Sciences and the Arts". Some were minor: "Population" was removed from "Philosophy" and put in Class II under "Government and Politics"; "Horsemanship, Hunting, Fishing &c.", which had formed one of the "Fine Arts", disappeared altogether as a sub-section, and was submerged into "Sports and Games", instead of being classified as an art presumably essential to any accomplished gentleman.(1) More interesting on their own account are the alterations to the sub-sections concerned with the natural sciences, for these are indicative of significant shifts in the way the sciences were viewed. In 1809 "Chemistry" appeared only as a sub-section of "Medicine", but by the mid-century it featured as a section on its own.(2) Perhaps most significant of all was the fact that Harris divided almost all science between the two sections of "Natural History" and "Mathematics" (with one other very small section on "Physics", comprising only meteorology, electricity and magnetism). All the descriptive sciences were allotted to Natural History, although one might at first sight be surprised to find "Mineralogy, Mines and Mining" included in that section.(3) All the experimental sciences were classed as sub-sections of Mathematics, the first listed being "Natural and Experimental Philosophy".(4) In Vincent's classification however the "Mathematical Sciences" were

(1) Ibid., pp.x-xi; Library Catalogue (1857), "Synopsis", pp.viii, xi.
(2) Library Catalogue (1809), p.xi; Library Catalogue (1857), pp.ix-xi.
(3) Library Catalogue (1809), pp.x-xi. This section also included museum catalogues and the journals and transactions of scientific societies.
(4) Ibid., p.xi.

confined to what is normally considered today to be mathematics, and the subjects formerly included in that science -"Astronomy", "Horology", "Navigation and Naval Architecture", "Optics and Perspective","Statics, Hydrostatics &c.", and "Mechanics" - became either sections in their own right, or sub-sections of "Natural and Experimental Philosophy".(1) The classification of the sciences in the mid-century thus reflected their emergence as separate subjects, each entire in itself, and the universalist Enlightenment view of the sciences as either natural history, mathematics, or medicine disappeared.

Nevertheless, as already noted, Vincent's general classification of the Sciences and Arts could hardly have been more wide-ranging. His whole catalogue, and thus his general classification of all fields of learning, still followed the eighteenth century pattern. The general balance of the Library was indeed little altered, although rather more scientific works were purchased than before. The Managers from time to time ordered the purchase of a list of scientific works,(2) but even though from 1851 onwards the Library Committee was dominated by men of science, the approach to purchasing policy continued to be a broad and general one. In part the R.I. still relied on gifts from scientific authors to maintain the scientific section, and there remains an impression that purchases were intended to fill gaps as these became noticeable, rather than to provide a considered base of knowledge and information on a given subject. Indeed the Managers appear to have relied on Vincent to point out any deficiencies, and it may have some significance that Vincent's own interests appear to have been predominantly philological, historical and biographical.(3) The Library continued

(1) Ibid., p.xi; Library Catalogue (1857), pp.x-xii; "Horology" disappeared altogether from this Catalogue.
(2) As in 1861 for example, 12 works were ordered at one meeting (Man.Min., XI.385 (1 July 1861)).
(3) Besides his R.I. duties, Vincent also had a connection with the publishers, Gilbert and Rivington, and saw through the press works on philology that they published. In addition, he edited Flügel's

above all else to be a non-specialised one. For example, in 1865 the Managers purchased a total of 126 books.(1) Of that number under a quarter, namely only twenty-seven works, concerned the sciences, even including medicine, mathematics, ornithology and conchology in that category. The remaining number comprised journals, literary periodicals, works on the ornamental arts, history, travel and politics, the classics of European literature, Parliamentary blue books, and a large number of standard reference books such as Dod's Parliamentary Companion, Lodge's Peerage, The Statesman's Year Book, the Annual Register, together with dictionaries, railway guides, travellers' handbooks, poll-books, university calendars and so forth.(2)

However, one may also see in the Library indications of the particular subjects that concerned educated men at the time. In the 1850s there was some concern for both the social and the technological applications of science. The journals taken in reflect the current outlook, and the new periodicals which were founded to deal with such subjects were ordered as they appeared, such as The Journal of Public Health and the English Journal of Education.(3) In the Library too were to be found the Annual Reports of the Registrar-General and of the Department of Science & Art, judicial statistics, the Census Reports, the Journal of the Statistical Society, and the reports of many Commissions of Enquiry, providing all the statistics so beloved of that first generation of social scientists.(4)

German Dictionary, revised Haydn's Dictionary of Dates and brought out a companion Dictionary of Biography (The Times, 5 May 1899). Vincent appears to have been given considerable freedom and asked for suggestions, as in 1861 he was asked to "prepare a statement of any books that may be wanted for the Library, and of any classes of subject in which the Library may be deficient" (Man.Min., XI.365 (4 Mar 1861)).

(1) 'Books purchased by the Managers' (1865-1896), entries for 1865; this volume is not paginated.
(2) Ibid., list for 1865.
(3) Man.Min., XI.128 (4 Feb 1856).
(4) Library Catalogue (1857); see sections on Government and Politics, in particular those on "Population" and "On the Poor, Poor Laws, &c.", and in Class VII, the section on "General Statistics".

In the 1860s a shift in emphasis is discernible. The two developments noted earlier with regard to the afternoon Courses of lectures and the Discourses, namely the introduction of the new sciences of man, and the stress on literary culture, were both to be found in the Library. If they were not already obtained in exchange for the R.I.'s Proceedings, the Proceedings of all the societies concerned with the human sciences were purchased, so that the transactions of the Archeological Association and the Ethnological, Philological and Palaeontographical Societies, as well as those of local societies such as the Surrey Archaeological Society, were brought into the Library.(1) On the other hand, the purely literary tastes of Members were gratified by the purchase of the new literary periodicals of the time, such as Macmillans Magazine and the Cornhill, both first published in 1859, and the Fortnightly Review in 1865.(2) In addition, the publications of the well-established book-clubs were provided for the Members' perusal as time went on, and in 1853 a subscription was taken out to the Camden Society (established 1838), and the forty-five volumes published by the Society up to that date were ordered.(3) In 1865 the publications of a similar book-club, the Surtees Society (established 1834) were ordered,(4) and a few years later in 1871 a subscription was taken out to the literary society whose foundation in 1864 marked a revival in literary scholarship, the Early English Text Society. Unlike the earlier societies, its publications were not designed "to appeal to a taste that had been under popular cultivation for a comparatively long time", but derived in large measure from the German tradition of scholarship, with an appeal primarily to trained scholars.(5) Another marked feature of purchases throughout this period was the substantial number of calendars of state

(1) 'Books purchased by the Managers' (1865-1896), list for 1865.
(2) Man.Min., XI.314 (6 Feb 1860), XII.123 (6 Nov 1865).
(3) Ibid., XI.12 (23 May 1853).
(4) 'Books purchased by the Managers' (1865-1896), entry for 10 Apr 1865.
(5) Steeves, op.cit., p.158.

papers, the early pipe rolls, and chronicles of mediaeval English History.[1] It is only fair to add that from the mid-1850s onwards an increasing number of specialised scientific periodicals were also ordered, notably many European journals.[2] It is evident that the quality of the Library as a whole was greatly enhanced once it became part of the R.I. proper and the Patrons' control of purchases was broken. Nevertheless, science remained no more than one department of a Library where learned interests which had no relation at all to science could be pursued in considerable depth, as indeed could be seen from the second volume of the Library Catalogue issued in 1882. This volume listed all the books purchased since the compilation of Vincent's Catalogue in 1857.[3] It was not evidently felt necessary to make any major changes in the old classification, but merely to add a few new sub-sections on specialised scientific subjects. Even towards the end of the nineteenth century, the Library then continued to follow an eighteenth century pattern. It contributed, as did the Discourses and the Courses of lectures, to maintaining the reputation of the R.I. as a centre where the best of the whole spectrum of learning could be found, and not only that concerned with the sciences. As a literary and philosophical society, it maintained the age-old tradition of devotion to a unified concept of learning and culture, and yet was still able to include within its broad view the new and increasingly specialised learning of the time.

The facilities provided in this respect were indeed fit for

(1) The Rolls Series was begun in 1848.

/ng (2) To name a selection - Di~~p~~ler's Polytechnisches Journal and Müller's Archiv für Anatomie, Physiologie (ordered Man.Min., XI.258 (6 Dec 1858)), the Zeitschrift der Chemie and Gazette Medicale de Paris (ibid., XII.132 (5 Feb 1866), and Berichte der Deutschen Chemische Gesellschaft (ibid., XII.253 (4 May 1868). At the same time however, less taxing relaxation could be found with Popular Opinion, the Pall Mall Gazette, and the Owl (ibid., XII.96 (6 Mar 1865)), the latter described by Pollock as "a sort of Punch for the upper classes of London society" (Pollock, opcit., ii.125).

(3) Catalogue of the Library of the Royal Institution of Great Britain (1882), vol.II.

connoisseurs of any branch of learning, but as seen in the preceding chapter, there was a level where appreciation became less learned and more purely diverting. The two were so close at this particular period that they are difficult to separate, yet it is important to examine the R.I. from this viewpoint, for changes in patterns of recreation and ideas as to what provided good entertainment, help to explain the R.I.'s particular success during these years. One feature which may be immediately singled out is the fact that during the mid-century listening to lectures was itself a recreation, a favourite pastime of both the educated and the less lettered alike. After all, the "literary" lecture became a very popular leisure pastime in this period, and also proved to be a source of innovation as well as a stimulus to the imagination, seen for instance in the immense popularity of Dicken's public readings, or in the novel and most successful experiment by W.R.S. Ralston, the Russian scholar mentioned earlier, of recounting stories from the lecture platform.(1) W.F. Pollock, who spent a large amount of his leisure indulging his taste for good lectures, was a typical enough man of his time. At the R.I., Pollock would generally attend one afternoon Course each year, in addition to the Juvenile Lectures (at least while his children were young), and many of the Discourses. This programme might be considered ample enough, but he would also attend the annual Bakerian lecture at the Royal Society, and probably the annual meeting of the British Association, as well as lectures in several other places during the year, as he did for example in 1863 when, jurist that he was, he showed a neat balance between both the scientific protagonists in the Origin of Species debate and his ecclesiastical friends, by going with Bishop Wilberforce to hear Richard Owen, and then with Bishop Colenso to hear T.H. Huxley.(2) Lecture-

(1) D.N.B., entry for W.R.S. Ralston.
(2) Pollock, op.cit., ii.109-10.

going was a recreation to be shared with friends, a social pastime, which may be compared with going to the theatre. The merits of different performers were expertly criticised by their listeners, to judge by the frequent comparisons of one lecturer's style against another's. Faraday was generally placed at the head of the league table, "the prince of scientific expositors" as Huxley said, or "the 'beau ideal' of a popular lecturer" as the wife of Richard Owen wrote.(1) Tyndall did not lag far behind, and Pollock as usual made a neat summing-up:

> Among all lecturers heard by me he (Faraday) was easily the first. Airy, Sedgwick, Owen, Tyndall, and Huxley belong to the highest order; but there was a peculiar charm and fascination about Faraday which placed him on an elevation too high for comparison (2)

Pollock was certainly a connoisseur, but for many people lecturers were the stars and public idols of their day. Notable figures in the world of both scientific and literary learning led active public lives, lectured widely and appeared at many public events. Such men tended to generate a following of devotees who followed them from place to place. As a fan of the most renowned of them all, T.H. Huxley, once wrote: "I never missed one of his lectures, whether at the Hunterian, Royal or London Institutions, or at working-men's institutes, or at St. George's Hall".(3) Tyndall too had such a following, although it was not as large as Huxley's, and from the evidence of his journals and correspondence, it is probable that young women formed a significant proportion, a feature which may no doubt be attributed in part to the fact that until 1876 Tyndall was considered as an eligible bachelor. Faraday and Tyndall both had reputations as superb lecturers, and this was at least

(1) Huxley to Professor Seth, 27 Oct 1893 (L. Huxley, Huxley, ii.358); Diary of Mrs. Richard Owen, 18 Jan 1840 (R. Owen, op.cit., i.153).
(2) Pollock, op.cit., i.247.
(3) Moncure D. Conway, Autobiography (1904), ii.174. Conway was an American Episcopalian Minister and journalist who came to England in 1863, took up Darwinism, and enthusiastically entered London scientific life.

as potent an element in attracting people to the R.I., as was any knowledge of or particular interest in their scientific work. The R.I.'s professors were always the star attractions of the lecture programme. In any event the mood of the audience was often relaxed and light-hearted. People laughed heartily if amused (as indeed they still do), they went to sleep if the lecture was boring,(1) and above all, if they approved, they showed it noisily. The Discourse would be interrupted by constant applause and punctuated by "hear-hear" and "loud and repeated cheers".(2) At the end the audience would crowd round the lecturer, as Professor Blackie recollected on a later occasion, "I was nearly smothered by oceans of old friends and swarms of unknown ones".(3)

Secondly, while the R.I. made an effort, particularly under Bence Jones' administration, to secure as speakers men of high intellectual calibre, considerable attention was also paid to that which was simply newsworthy in itself. The Institution's attitude to controversy provides an obvious case. The 1860s were a decade particularly fertile in scientific controversy, which was anything but confined to scientific circles at that time, but engaged men of all professions and persuasions, except in the most specialised cases. The Origin of Species was merely the most notorious of these many debates. The R.I. was not a platform

(1) The Managers recurring concern about the proper ventilation of the lecture theatre was probably due less to sanitary considerations than to the overwhelming tendency to sleepiness induced by a warm evening and a full house. Cartoons of lectures at the R.I. theatre invariably showed one or two of the Managers asleep in the front seats, such as that showing Huxley lecturing sometime in the 1860s (Cartoon by Harry Furniss for Punch; original preserved in the R.I.). Indeed the ability of the lecture theatre to produce instant somnolence even in confirmed insomniacs became something of a favourite R.I. joke.

(2) George Catlin to his parents, 17 Feb 1840 (Roehm, op.cit., p.157). The light-hearted and noisy response was most remarked upon by those who were not regular R.I. speakers, as was the case in a Discourse given in 1863 by Frank Buckland, the naturalist (G.C. Bompas, The Life of Frank Buckland (1885), p.127).

(3) J.S. Blackie to his wife, April 1880 (Walker, op.cit., p.270).

from which sustained controversy could be conducted, but the Friday Evening Discourses did allow for passing shots on all the major issues. While the tone on controversial issues tended to be fairly restrained, it was nevertheless much freer than was often the case in the Royal Society or in the specialist societies. The conventional approach in these in for example the Origin debate, was to allow purely factual descriptions which it was considered would help to enlarge knowledge, but to refrain from any discussion of the theoretical issues posed by these factual descriptions.(1) In consequence, there were few explicit references to the subject at all in the learned societies. By contrast the R.I. did not feel bound by such conventions, and Huxley for one made full use of the freedom. Nonetheless, anti-evolutionists were not totally excluded from the platform: Richard Owen, Fullerian Professor of Physiology until the end of 1861 could hardly be omitted,(2) and in 1861 a Discourse was given by J.O. Westwood, the first professor of invertebrate zoology at Oxford and a confirmed opponent of Darwin.(3) In the 1870s however it is noticeable that people who disagreed with Tyndall were no longer invited, which cut out a number of potential speakers. In 1873 Ruskin, hitherto one of the most popular of speakers at the R.I., attacked Tyndall's theories on glaciers in Fors Clavigera and was never invited to lecture again at the R.I. In any case, the Friday Evenings had too a semi-private nature, being restricted to Members and their guests, and it might therefore be awkward and insensitive to say the least, to invite anyone who had publicly attacked the Institution's Professors in the violent tones that Ruskin used.

(1) On this question, see F. Burkhardt, 'The Comparative Diffusion of Darwinism, England and Scotland: the Learned Societies', in Thomas F. Glick (ed.), The Comparative Reception of Darwinism (1974).

(2) Owen was however restrained at the R.I., and his Discourse in 1861 was on the relatively neutral subject of "The Scope and Appliances of a National Museum of Natural History" (no abstract in P.R.I.).

(3) J.O. Westwood (1803-1893), D.N.B.

If one examines the list of the most popular Friday Evening Discourses given on non-scientific subjects, when a full house of 800 or more people crowded the theatre, it is clear that the speakers' popularity was as much determined by the notoriety they had acquired shortly before being invited to the R.I., as by their intellectual calibre. The list of outstandingly popular non-scientific Discourses between 1840 and 1875 runs as follows:(1)

1855 Col. H.C. Rawlinson: 'Excavations in Assyria and Babylon'.
1857 E.B. Denison: 'The Great Bell of Westminster'.
1858 H.T. Buckle: 'The Influence of Women on the Progress of Knowledge'.
1861 P.B. du Chaillu: 'Travels in Western Central Africa'.
1861 John Ruskin: 'Tree Twigs'.
1863 Cardinal Wiseman: 'Points of Contact between Science and Art'.
1863 Capt. J. Speke: 'The Discovery of the Source of the Nile'.
1866 A.P. Stanley: 'Westminster Abbey'.
1868 Samuel Baker: 'Abysinnia'.
1869 John Ruskin: 'The Flamboyant Architecture of the Valley of the Somme'.
1870 John Ruskin: 'A Talk respecting Verona and its Rivers'.
1872 Cardinal Manning: 'The Demon of Socrates'.
1874 Samuel Baker: 'The Suppression of the Slave Trade of the White Nile'.
1874 A.P. Stanley: 'Roman Catacombs as illustrating the Belief of the Early Christians'.

For most of these speakers, the decisive public event of their lives had occurred shortly before. Denison was at the time a member of the Committee set up to advise on the casting of the great bell, Big Ben, for the clock tower at Westminster, about which there was considerable disagreement.(2) Buckle's celebrated History of Civilization in England had been published in the previous year, 1857.(3) In 1861 Du Chaillu

(1) Abstracted from 'Index to Lectures' (1842-1865) and (1866-1939).
(2) On Denison, see Appendix II.ii. Wheatstone was also a member of the Big Ben Committee, and for an account of the incident, see Bowers, op.cit., pp.208-10.
(3) H.T. Buckle (1821-1862), D.N.B.

had just published his controversial Explorations in Equatorial Africa.(1) In 1863 Speke announced that the Nile had been traced to its source and was attacked by his fellow explorer, Richard Burton.(2) A.P. Stanley, appointed Dean of Westminster shortly before in 1864, attracted public controversy by seeking the support of scientists for prayers for deliverance from the cattle plague of 1866. Samuel Baker had met the Speke-Burton expedition in 1863, and published an account of his journeys in 1866, which gained him a reputation as an intrepid explorer.(3) Only Ruskin, Manning and Wiseman had long had established reputations. Explorations and excavations were in any event bound to be popular attractions, as the public had an unbounded appetite for travellers' tales. Such topics were regularly part of the programme, together with those of speakers who had only recently acquired fame. This remains equally true of those Discourses which attracted a very large crowd, that is to say between 600 and 800 people, but not the excessive numbers of over 800 attracted by the speakers just listed above. For example, in 1856 Humphry Sandwith gave a Discourse on "The Siege of Kars" shortly after the end of the Crimean War where he had been at the defence of Kars;(4) in 1865 W.G. Palgrave spoke on "Central and Eastern Arabia", hot on the heels of the publication of his travels as the first man to journey across central Arabia;(5) in 1868 Emanuel Deutsch, the Semitic scholar, discussed "The Talmud", shortly after his essay on the subject

(1) P.B. du Chaillu (1835-1903), traveller and explorer. Doubts were cast on du Chaillu's veracity after the publication of his Explorations.
(2) J.H. Speke (1827-1864), Richard Burton (1821-1890), D.N.B. Speke's Discourse was an extra evening specially put on at the end of the season, when the Prince of Wales took the chair ('Index to Lectures' (1842-1865), p.116).
(3) Samuel Baker (1821-1893), traveller and sportsman, D.N.B.
(4) Humphry Sandwith (1822-1881), army physician, D.N.B. In the same year, 1856, Sandwith published a narrative of his adventures. His Discourse was given on a Monday, and appears to have been the only occasion when a Discourse was given on a day other than Friday (P.R.I., ii (1854-58), 246).
(5) W.G. Palgrave (1826-1888), diplomat, D.N.B.

in the Quarterly Review had created a sensation;(1) in 1873 Sir Henry Rawlinson recounted "Livingstone's Explorations in Africa", shortly after the excitement in the previous year caused by Stanley's accounts of his meeting with the famous missionary.(2) On the other hand, the popularity of C.H.G. Williams' Discourse in 1869, "Female Poisoners of the 16th and 17th centuries" pandered more to a perennial taste for the morbid and sensational.(3)

The popular, the controversial and the newsworthy were however ephemeral attractions which changed from year to year. The more abiding attraction of the Institution to its Members was its very nature as a literary and philosophical society, that is to say, a species of club for both the cultivation of superior interests and the gratification of companionable instincts. The purely social role of the R.I. in the life of its Members was indeed an important one. Any learned society offered its members those social pleasures so well understood by the Rev. A. Hume:

> Independent of the general effect which all these societies produce upon the public, they are of great importance to their own members. There is, in the first instance, the companionship with men of similar tastes and habits, and perhaps of the same general pursuits ... The meeting of several of these at stated intervals, on the common ground of friendship as well as of literary or scientific inquiry, is a gratification which is justly prized by the members. (4)

The R.I. provided just such a venue, with its elegant Library, newspaper and reading rooms. The latter were open from nine o'clock in the morning

(1) E. Deutsch (1829-1973), D.N.B.
(2) Sir Henry Rawlinson (1810-1895), D.N.B. Rawlinson was President of the Royal Geographical Society in 1871-72, and the R.I. naturally invited him, rather than the sensational and controversial Stanley, to give an account of Livingstone.
(3) C.H.G. Williams (1829-1910) was a respectable research chemist (D.N.B.). In 1868 he gave a Discourse on the "Artificial Formation of Organic Bodies" which attracted only 364 people, whereas his more sensational choice of subject the following year attracted double that number, namely 718 people ('Index to Lectures' (1866-1939), pp.17, 21).
(4) Hume, op.cit., p.12.

to eleven at night, and the Library from ten in the morning to ten at night, thus giving the club members ample time to use them.(1) Several copies of all the main daily newspapers were ordered, as well as publications as diverse as Punch, Allen's Indian Mail, the Shipping Gazette or the Clerical Journal to cater for the Members' varied interests.(2) As described earlier, the Members had their General Monthly Meetings to deal with each other's affairs.(3) It deserves indeed to be emphasized what an important part learned societies played in the nineteenth century in the normal social life of their members, and what a large amount of time was spent in participating in their activities.

In addition, the Institution's major social occasions on Friday Evenings seldom clashed with the meetings of any other learned society.(4) These Meetings provided an excellent occasion for meeting friends and colleagues, for listening to a good lecture, for admiring the objects exhibited in the Library and ante-room, while at the same time entertaining one's selected guests. Indeed at this time a favourite form of entertainment was the soirée. Frequently a soirée would be given on a theme, sometimes a scientific and sometimes a literary theme, and was considered an elegant and interesting way of providing for one's guests' entertainment. For example there are records of aristocratic receptions which presented a scientific or geological theme, as when Gideon Mantell displayed his bones of prehistoric animals and ethnological specimens in Lord Rosse's drawing room at a reception in 1847.(5) General Sabine, as President of the Royal Society, gave an annual soirée at the Royal

(1) Opening hours were given in the 'Prospectus' for each year. Tyndall's friend, T.A. Hirst, used the reading room on occasion although he was not a Member (Hirst Journal, III.1584 (28 July 1861)).
(2) Man.Min., XI.464 (2 Feb 1863), XII.225 (27 Jan 1868). However a suggestion from a Member that the "Daily Stock Exchange List" should be taken in, was declined (ibid., XII.431 (13 Jan 1873)).
(3) See above, pp. 119-20.
(4) See the calendar printed in Hume, op.cit., pp.xxiii-xxxii.
(5) Curwen, op.cit., p.290.

Society, when Tyndall on occasion provided a display of interesting experiments, as his friend T.A. Hirst, wrote in 1865: "The Prince of Wales was there and witnessed Tyndall's experiments on Obscure Radiation. He lighted his cigar at the dark focus".(1) Such incidents provide a picture of what can only be described as the presentation of an amusing toy or conjurer's trick for the guest's diversion.(2) It is not too far-fetched to regard the entertainment provided at R.I. Friday Evenings in the light of a soirée, rather than solely that of listening to an interesting or unusual lecture.

Certainly all the ingredients of a soirée were provided. Quite apart from the lecture, there was always a display of objects in the Library and sometimes in the ante-room as well. These exhibitions of objects, which prove to have been of a bewildering variety, merit some attention here, since better than anything else they illustrate both the varied and non-scientific interests encompassed by the Institution, as well as the importance of these activities to its Members. Soon after the first Discourses were given, lists of objects on display in the Library appear in Faraday's notebooks. From the beginning of 1827 these lists became longer, and may be divided into the following categories: useful objects ("Mr. Blackadder's Capillary wick'd lamp"), the inventions of science ("Mr. Wheatstone's Kaleidophone or Phonic-Kaleidoscope"), the curiosities of nature ("Specimens of Captain Brown's conchology"), books and manuscripts of interest to the learned gentleman ("Greek MS of the 14th century", "MS of the Gospels of the 11th century"), objects of aesthetic and artistic interest ("The Passion of

(1) Hirst Journal, IV.1722 (12 Mar 1865).
(2) The tone of royal patronage of science also exemplifies the changes discussed above, from the sober utilitarian interest of the Prince Consort, to the amused dalliance of the Prince of Wales. The latter did however generally attend one Discourse each year in the 1860s, including some on scientific subjects, such as in 1865, A.W. Hofmann on "The Combining Power of Atoms" (P.R.I., iv (1862-66), 401), but from 1870 his presence was extremely rare.

Christ by Albert Durer"), and articles illustrating the life and culture of distant lands ("A rich Persian Sabre").[1] Even at this early date most of the objects had no relevance to the topic of the evening's lecture, but they were a part of the conversazione as it was originally envisaged. Their purpose was to inform, to be admired, and to give pleasure to those present. Details of these objects appear in the R.I. Proceedings for a short period during the years 1851 and 1852, for there is a gap in the detailed evidence after 1840 when Faraday's notebooks on this topic ended. Again there is a gap after 1852 when the lists of exhibits have been lost until the 1890s. Furthermore, after the Discourse itself was over, an additional entertainment was often provided in the Library, especially in the 1830s and 1840s and certainly well into the 1850s. It was frequently Faraday himself who provided this extra interest, as in 1851 for example, when he gave a description of Ebelman's "Artificial Production of the Ruby", after a Discourse by William Hosking on the quite unrelated topic of "Ventilation by the Parlour Fire".[2] Wheatstone too often demonstrated his apparatus or inventions.[3] Another frequent exhibitor was again a friend of Faraday, Cornelius Varley, the water-colourist, inventor and maker of philosophical instruments.[4] Varley, together with his colleague, a Mr. Ross, often provided biological demonstrations, which were evidently their scientific hobby, rather than a display of scientific instruments which one might have expected. But as the Managers gratefully said, their exhibitions added to the Friday Evening Meetings

(1) Faraday MSS, Notebook (10), 'List of F.E. Discourses Feb 1826-June 1836 by Faraday and others. List of Exhibits at each'. This notebook is not paginated, and the objects listed above may be found respectively under the following dates: 26 Jan 1827, 11 May 1827, 27 Apr and 4 May 1827, 27 Apr 1827, 4 May 1827, 11 May 1827.
(2) P.R.I., i (1851-54), 83-4. For other examples, ibid., pp.37, 75-6.
(3) Wheatstone was often among those thanked for their efforts at the end of each season, as for example in 1842 for exhibiting his working apparatus (Gen.Min., V.171 (4 July 1842)).
(4) Cornelius Varley (1781-1873), D.N.B.

"an interest enhanced by the kindness of their constant attention".(1) Varley continued to show his microscopical discoveries into the 1850s, and on a typical evening he would show the following type of demonstration: "Snails' eggs, the heart beating - Wheel Animalcules - Circulation of blood and peristaltic motion in small worms, and the circulation of sap in the Nitella".(2) In the 1860s however Tyndall does not appear to have followed Faraday's practice, although it is not known whether the sort of show provided by Varley was still continued.

There was certainly a concerted effort to make the exhibition of objects generally an attractive and interesting part of the evening's entertainment. One of the duties of the assistant secretary was "to seek out objects of interest for the Library Table".(3) The United Service Institution, the Royal Asiatic Society and the Society of Arts regularly lent objects for exhibition.(4) As was to be expected from such lenders, their objects were rarely very scientific in nature, but were generally either curiosities or objects concerning the arts and life of foreign countries. However, the detailed lists of objects exhibited for 1851 and 1852 reveal certain characteristics and developments. First of all in 1852 the list of objects lengthened substantially. The number naturally varied from meeting to meeting, but from the normal eight or so single items or groups of objects and specimens noted in 1851, there were more than twenty items or groups listed by the end of the season in June 1852.(5) The vogue for exhibitions of all types was a feature of the years immediately following the Great Exhibition in 1851, which may perhaps account for the increased emphasis on this aspect of the evening's entertainment. The sheer number of objects may also

(1) Gen.Min., V.210 (3 July 1843).
(2) P.R.I., i (1851-54), 221.
(3) Man.Min., IX.414 (16 Nov 1846).
(4) Thanks were regularly rendered to these societies at the final General Monthly Meeting of the season in July.
(5) See the last list entered for 11 June 1852, P.R.I., i (1851-54) 220-21.

explain why from 1853 the list was omitted from the Proceedings. Whether after than time the number diminished at all is unknown, but the lists of the 1890s number between twelve and twenty items.(1) Secondly, the type of exhibitor was more varied in the 1850s than in the 1830s. At the earlier time the exhibitors were generally the institutions mentioned above, such as the United Service Institution, or Members of the R.I., or the possessor or inventor of some useful object thought appropriate for display. In the early 1850s all these were still present, but there was a larger number of objects exhibited by people who had no apparent connection with the R.I., and also there were many exhibits by commercial firms.

The commercial exhibits are of particular interest. In part they appear to be little more than merely an advertisement for the company's wares, as for example, "Bodley's Revolving and Sliding Window-Sashes",(2) but in part they were also a demonstration of the achievements of applied science in the manner of the Great Exhibition. There were it is true some exhibits of a technological nature, such as "Models of Marine Engines" by Messrs. Maudslay & Field, or "Seaward's Patent Brine-valve and Saline Detectors", but exhibits by the commercial users of scientific technology were comparatively rare.(3) The firms most frequently mentioned in these two years, 1851 and 1852, were Leadbeaters (producers of stuffed animals, and ornithologist to the Queen), Hunt & Roskell (gold and silversmiths), Elkingtons (electroplaters and silver-smiths), Varleys (Philosophical instrument makers), Copelands (pottery manufacturers), Leightons (bookbinders) and Henneman & Malone (photo-graphers).(4) Of these, the work of Leadbeaters and Hunt & Roskell

(1) R.I. MSS, two boxes, 'Friday Evening Discourse Exhibits', 1895-96, 1897-1920. The items in the first box date from 1892, not from 1895 as stated on the label.
(2) P.R.I., i (1851-54), 42.
(3) Ibid., i.162, 167-8.
(4) Ibid., passim. See London Post Office Directory (1851) for their business descriptions.

appeared more regularly than that of any other company. The outstanding feature of their work was hardly technological usefulness, but more the object's aesthetic and artistic quality, seen for example in Hunt & Roskell's specimens, "Lord Faversham's Prize Ox in Silver", or their "Silver-Gilt Shield of Boadicea".(1) Or else there were numerous products of that marriage of culture and utility, the new objets d'art that were considered such good taste, epitomised in the electro-plated vases and table centre-pieces turned out by Elkingtons in their hundreds. In a slightly different vein, the "machine sculptures" exhibited by Mr. Cheverton, another frequent exhibitor, of "The Theseus and Ilyssus", or "Cardinal Wiseman, from the Bust by Mr. C. Moore",(2) were part of the same current of opinion that found such monumental expression in the Great Exhibition. On a smaller scale, one finds at the R.I. precisely the same type of object exhibited for its Members' edification and admiration. Thus the appeal was less an admiration of the achievements of science, but far more a response to the prevailing aesthetic tastes of the period, a reflection of the enthusiasm for those first mass-produced objets d'art which soon filled every middle-class home with a clutter of engravings, electro-plated objects, photographs and ornaments of every description.

Another very noticeable feature of these exhibitions was that they provided an occasion for the Institution's Members to indulge the love of curios so typical of the age, and to display their own collections. Mineral, geological and palaeological specimens were extremely popular. It is evident that frequently a Member's exhibits had nothing to do with his professional occupation, and fall clearly into the category of hobby. For example, T.N.R. Morson, an operative chemist, frequently displayed chemical specimens, but also his collection of shells.(3) James Tennant,

(1) P.R.I., i (1851-54), 168, 74.
(2) Ibid., i.201, 204.
(3) Ibid., i.210.

the well-known mineralogist and a friend of Faraday, exhibited not only gems and mineral specimens, but had a fondness too for their aesthetic applications, shown in his "Greyhounds in Bronze –– Inlaid Marble Table from Derbyshire ... Two Marble Vases copied from the Etruscan ..."(1) Members' collections however were often of a very miscellaneous nature, and the display by Dr. W.V. Pettigrew, listed below was fairly typical:

> Idol in Granite - Clay heads and Figures, from the Pyramids at Mexico - Mediaeval Copper Vase and Spoon - Chinese Compass, and Cup &c. - Specimen of Ancient Papyrus - Handle of Knife, in carved wood (from Strawberry Hill) - "Eve", in Roman Bronze - Head of a Faun, from Carthage.(2)

Further evidence of the very unscientific nature of the Friday Evening exhibitions may be found in the fact that paintings were regularly shown. Some of these were by amateurs, such as P.W. Justyne's "View of a Mountain Stream, sketched in the Tropics", or a "Drawing in Water Colours - Hall Sands, Devon" by G. Barnard.(3) On the other hand, the work of professional painters was also exhibited, which suggests at least that the R.I. was considered by some in artistic circles as a place where portrait commissions might be found. H.W. Pickersgill (1782-1875), appears to have considered it in that light, although he also exhibited curios himself.(4) He was not a Member, but had been granted in 1831 the right of entry to all afternoon lectures and Discourses, having tactfully presented the R.I. with a portrait of Faraday hot on the heels of the latter's discovery of electro-magnetic induction. In 1857 he presented the R.I. with another portrait, this time of the Rev. John Barlow, as a token of the "high gratification and instruction" afforded him by the Institution's meetings.(5) The works

(1) *Ibid.*, i.189.
(2) *Ibid.*, i.189.
(3) *Ibid.*, i.189. 139.
(4) *Ibid.*, i.220. After Sir Thomas Phillips died, in 1845, Pickersgill had almost a monopoly of painting the portraits of eminent people (*D.N.B.*).
(5) Man.Min., XI.182 (6 Apr 1857).

of J.Z. Bell, a minor but prolific portrait painter, were frequently exhibited. Many of his subjects were men of note in the medical and scientific world, but he also exhibited the "Sketch of a Poor Irish girl" and similar subjects.(1) On one occasion a portrait by Daniel Maclise was to be found, sandwiched apparently between "Fossils from the Coal-pits, Lesmahago, Scotland", and "Specimens of Sussex and Purbeck Marbles".(2) Indeed it would be interesting to know how the portraits were displayed, and whether they were for instance given special pride of place on a stand (a newspaper stand would have served), or left lying on the large central table.(3) Another exhibitor was Thomas S. Watson, Secretary of the Art Union of London.(4) The Art Union was a splendidly imaginative and successful blend of mid-Victorian culture and commerce.(5) It encouraged the promotion of high standards in art by commissioning prize-winning pictures, sculptures or medallions, and also combined these cultural advantages to its numerous subscribers with pecuniary benefits, for the winner of a lottery was allowed to select one of the prize-winning objects, and the rest of the members were presented with an engraving. They were also allowed to purchase artistic objects, medals and so forth at low prices. In June 1852 Watson exhibited at the R.I. one such prize-winning object, "Solitude" by J. Lawlor, which was then reproduced by Mintons for distribution to Art Union subscribers.(6) It would be revealing to know whether Watson

(1) P.R.I., i (1851-54), 201. Among the scientific and medical men whose portraits by Bell were exhibited, were John Dalrymple, the ophthalmic surgeon, and Sir Henry Holland (ibid., i.197), Sir Benjamin Brodie, the eminent surgeon (ibid., i.201), Dr. Chambers, probably the former St. George's Hospital physician (ibid., i.210), and Dr. Roxburgh, a physician at the Western General Dispensary (ibid., i.220).
(2) Ibid., i.146.
(3) A "double Newspaper-Standard" was purchased in 1855 (Man.Min., XI.90 (5 Feb 1855)), but it is not known whether the R.I. possessed one earlier.
(4) Thomas S. Watson (1815-1891), Secretary of the London Art Union from 1845 to his death (Boase, iii.1230).
(5) It has been briefly described by E. Aslin, 'The Rise and Progress of the Art Union of London', Apollo (January 1967), 12-16.
(6) P.R.I., i (1851-54), 220.

(who was an R.I. Member) exhibited most of the prize-winning pictures or sculptures at the R.I., as either an advertisement for the vitality and achievements of contemporary art, or in order to encourage people to join the Art Union, which was a very middle-class affair for those who could not afford to buy original works of art.

Curios, the monstrosities of nature, scientific devices, models, specimens, ornaments, portraits, books, manuscripts and the products of technology jostled each other in what must have been an untidy jumble. "Nelson's hat" was found alongside "Wire Models illustrating Geometry, Crystallography &c." and "Specimens of Carving in Wood"; the "Specimen of Decorative Drawing (by a Lady)" together with "Dr. W.B. Herapath's Iodine of Disulphate of Quinine" were all brought together on the same evening in the Library.(1) The exhibits must have changed as time went on, although the lists from the 1890s have a remarkable similarity to those of the 1850s. There were it is true far more instruments or apparatus exhibited which had a direct connection with the subject of the evening's Discourse, but on non-scientific evenings, the exhibits have the same miscellaneous quality as they had forty years earlier: "Old Hebrew MSS and Books from Persia", "Photographs: Portraits of Tennyson, Browning, Watts, Irving (as Becket) and others", "Platinum Pan lined with Gold", and even engravings from the Art Union - "Souvenir of Velasquez" and "Late for the Ferry".(2) This suggests once again a remarkable continuity, but also a fossilisation which it would have been almost impossible to avoid.

By the end of the 1860s the R.I. contained two elements that were in effect for the first time quite disparate, the scientific and the

(1) Ibid., i.178.
(2) Objects all exhibited on 17 March 1893, on the occasion of W.J. Russell's Discourse on "Ancient Egyptian Pigments" (Box, 'Friday Evening Discourse Exhibits, 1895-96).

literary. Because it was a literary and philosophical society, it had maintained as essential for its Members the general cultural side of its activities, and these became far more important than has been considered hitherto. Because too the recreation of intelligent and leisured people in the 1860s was the cultivation of learning to a high level, the R.I. was extremely successful under the astute management of Bence Jones in satisfying those interests. As time went on, and fashions changed, so too did types of recreation, and the R.I. found it increasingly difficult to maintain the same high quality of general culture at a time in the latter part of the nineteenth century when the scientific world both became divided within itself due to increasing specialisation, and more and more cut off from the general world of letters and cultured learning. In the 1870s there are pointers to a decline in quality which seem to reflect a lower level of interest and knowledge in the audience that patronised the R.I. The range of non-scientific Courses of lectures became almost desperately wide, swinging from such extremes as the theatre in Shakespeare's time to comparative politics, or from the history of Mohammedanism to daemonology.[1] Two of the worst attended Courses of lectures since the 1840s were those by John Morley on "Limits of the Historic Method" in 1873, and by R.K. Douglas on "Chinese Language and Literature" in 1875.[2] By this time the Members seem to have lost any interest in serious social questions. In 1875 J.H. Gladstone's Discourse "On the Progress of Science in Elementary Schools" was the worst attended that year.[3]

(1) Courses on all these subjects were given between 1872 and 1874.
(2) Attendance at Morley's Course averaged only ninety-one people at each lecture, and at Douglas' Course little better at 102 people at each lecture ('Index to Lectures' (1841-1912), pp.184, 197).
(3) Only 254 people came, a very poor number for a Discourse ('Index to Lectures' (1866-1939), p.62). The decline in interest in this type of social question occurred elsewhere, and for example the National Association for the Promotion of Social Science activities slowly declined from its vigour of the 1860s, collapsing in 1886.

Scientists seem to have been more outspoken than before about what a "peculiar audience" one found at the R.I., or indulged in dark utterances such as Clerk Maxwell, "I do not think the R.I. a good place to go to of nights, even for strong men".(1) But until the end of the period under discussion, 1873, the reputation of the R.I. stood high. Its success as a cultural institution was unchallenged. The literary side of its activities contributed greatly to the success of the 1860s, but this broad, literary interest was itself the survival of an older tradition of gentlemanly culture and learning. After the relevance of that tradition to the needs and tastes of those years had vanished, this aspect of the Institution's activities inevitably became fossilised. Yet the R.I. still contrived to maintain the public reputation that, as Becker quaintly put it, it was endeavouring "to inoculate the _grand monde_ with a love of scientific investigation",(2) while in reality it had to cater more and more for what might best be described as the social and the intellectual pretensions of the Barbarians and Philistines, as Matthew Arnold termed the majority of the middle-classes. It was nonetheless the unique achievement of the R.I. to remain viable as both a literary and philosophical society and as an institution for the pursuit of scientific research. This combination of what at first sight appear to be polar opposites more than anything furnishes the key to explaining the Institution's especial success in the 1860s as well as its survival into a new world of specialised twentieth-century science.

(1) J. Clerk Maxwell to C.J. Munro, 15 Mar 1871 (L. Campbell and W. Garnett, _The Life of J. Clerk Maxwell_ (1882), pp.379-80).
(2) Becker, _op.cit._, p.52.

Chapter 6

Conclusion: The End of a Formative Period

In March 1873 Bence Jones resigned the Secretaryship, and died a month later.[1] A few months after this, Sir Henry Holland too died, and the disappearance of these two figures marked the end of an epoch in the history of the Royal Institution. The year 1873 however signals more than merely a change in the holders of the Institution's two chief offices. It forms a resting place in the Institution's history, a natural point at which to assess the developments of the preceding decade, for it is apparent that this year, 1873, marked not only the end of a period of change and adaptation, but the end of a period which proved to have been decisive in fixing both the goals of the Institution and the form in which it would survive for the next forty years, if not indeed to the present day. The twin characteristics which ensured the R.I.'s survival into a new and ever more rapidly changing world of science were, on the one hand, a capacity for considerable adaptability in periods of rapid change, and on the other, an extreme addiction to tradition. For, as many studies of English institutions have brought out, continuous survival was the fruit of a nicely judged compromise between the new and the old.

By 1873 the Institution had defined its objectives and overhauled its administration to provide the framework of a research institution which was thoroughly modern by the standards of that day, in England at least. The administrative structure was reorganised into a coherent, unitary form, and the last vestige of semi-independent bodies housed within the Institution disappeared when the Library and Laboratory finances were merged into the Institution's general fund. New labora-

(1) Man.Min., XII.438-9 (3 March 1873).

tories had been built, apparatus purchased, assistants engaged and every effort made to ensure that the Institution's professors were able to devote their first attention to research. Yet this was not a straightforward process, or the result of some inevitable or 'natural' development in an institution such as the R.I., and the contrast between the Institution in the early 1840s and the Institution as it was in 1873 was certainly a striking one. There is of course also a sense of familiarity as one sees institutional customs and traditions maintained over several decades. Nevertheless, the survival of the R.I. as an institution specifically for the prosecution of scientific research, was due to the developments of these crucial years in the mid-nineteenth century, when in contrast to the incidental fashion in which pure research had first become one of the Institution's activities in the late 1820s and early 1830s, a deliberate, conscious and determined effort was made by the men involved in the Institution in these years to ensure that disinterested scientific research should become, not one, but the first of all the Institution's objectives.

As has been argued earlier, in the 1840s scientific research was only one of the Institution's concerns, and its chief competitor was education, both in terms of professorial time and in the use of facilities.(1) In that decade the R.I. was obliged to resolve its position on education, and was gradually forced to abandon its desire to maintain its former reputation as a school of chemistry, in circumstances where unless it changed radically, the R.I. no longer had any place in the new framework of institutions founded to provide specialised scientific education. The issues were first rehearsed in 1843 with the proposal to set up a school of practical chemistry, and more forcibly a few years later in 1848 and 1849, when Benjamin Collins

(1) See above, chap.3.

Brodie attempted to make the laboratory lectures a properly instructive instrument of scientific education.[1] It cannot be merely coincidence that just over a year later the R.I. defined its objectives, and for the first time named scientific research as an objective, although it did not relinquish its general educative aims. Specialised scientific education was however quietly abandoned, as the Institution first put forward a clear claim to recognition as an institution for scientific research. The decision taken in 1851 to publish its Proceedings annually, formed as it were a statement of intent, and staked out a claim to scientific status among learned societies at a significant moment in its history. The decade of the 1850s was however primarily one of quiet consolidation while the new recruit to the ranks of experimental scientists who worked at the R.I., John Tyndall, established himself. Furthermore, the 1850s were Faraday's final decade of active work at the R.I., and were for him a period when he carried out more work on problems of applied science than he had done during the two preceding decades.[2] Faraday became, as Brande had been before him, London's acknowledged authority on science in its practical applications, and such a point makes it easier to understand why it was so long before the Institution came to grips with the implications of its declared aim to pursue disinterested scientific research. It needed a man of Bence Jones' calibre and energies to spell out in unmistakable terms the Institution's objectives and the means of achieving them. The period of Bence Jones' secretaryship, 1860 to 1873, has a continuity and unity of purpose which was undisturbed by the passing in 1867 of the much-loved Faraday. Bence Jones' achievements in creating the practical environment for the pursuit of research were considerable, and reached their culmination in the rebuilding of the laboratories in 1871 and

(1) See above, chap.3.
(2) See above, p. 155.

1872. While financial constraints were always present and Bence Jones failed to solve the Institution's financial problems on any longer term basis, his achievements should not be underrated, since without his efforts it is probable that at the very least far less work would have been done in the 1860s, without the aid of assistants and new apparatus, still less the creation of new laboratories. Moreover, it was Bence Jones' presence in a position of power, with his distinctive ideas on scientific research, together with those of the other Managers in the same period, which ensured that the definition of scientific research was made in a particular way and that it should continue at the R.I. in that one particular form, a form that succeeded in surviving in an immensely changed environment.

In that period, 1860 to 1873, the R.I. identified itself with the ideal of disinterested or unfettered scientific research. Its professors and its laboratories became its conscious raison d'etre. Their research was not to be undertaken to solve immediate practical problems, but solely for the advancement of pure knowledge alone. This was indeed Faraday's legacy - although one should remember that he had never been wholly able to devote himself to pure research - and became embodied in the Institution's tradition. But such an ideal had important practical consequences. Most important of all, because research must be disinterested, it followed that it must be financed by private philanthropy alone. Its independence could be maintained only if support was forthcoming from private sources. Bence Jones specifically rejected any possibility of Government aid: "I ask for no subsidy for the Royal Institution from the Government", as he wrote in his Report in 1862.(1) This was in contrast to views that were beginning to be expressed in the 1860s, and rather more loudly in the 1870s, that increased aid for

(1) Bence Jones, Report, p.12.

science and for scientific men was essential and that it was the duty of the Government to provide it. Bence Jones however viewed the Government as an enemy who might lure the R.I.'s precious but underpaid professors away,[1] an attitude that Spottiswoode echoed when appealing for funds to pay the professors properly so that "neither Government appointments, nor University professorships, nor the liberality of mercantile men, should be able to lure them from the path of discovery, to tuition, to arts, to manufactures".[2] Not only therefore did the Government, but also academic and commercial interests appear inimical to the pursuit of disinterested research. Although indeed Bence Jones' appeal in his Report for a living wage for the R.I.'s Professors antedated the same call on behalf of scientists generally from the reformers of the movement for the endowment of science,[3] the R.I. as an institution played no part in that movement because it had already adopted a position of opposition to State support so far as its own activities were concerned. On the contrary, it became rather complacent about the achievements of its research laboratories, no doubt because it could point to an ever lengthening list of historic discoveries extending over many years. As a body, therefore, the R.I. early retreated from those developments that helped to bring about the establishment of research institutes and university fellowships by the end of the nineteenth century.

Furthermore, private patronage, a tradition itself of long and distinguished lineage, had another characteristic feature as far as the world of science and learning was concerned, namely, that the object

(1) Ibid., p.4; Bence Jones spoke of resisting "the temptations which the Government and private Societies may offer; temptations which are increasing daily, and which a few years back did not exist".
(2) W. Spottiswoode, 'The Old and New Laboratories at the Royal Institution', P.R.I., vii (1873-75), 9[illegible].
(3) Bence Jones, Report, p.10, cited above, p.158; R. M. Macleod, 'The Resources of Science in Victorian England: the Endowment of Science Movement, 1868-1900', in P. Matthias (ed.), Science and Society 1600-1900 (1972).

of patronage was very often an individual rather than an institution. Until the 1870s patronage of individual efforts, not of institutions, was also the preferred method of Government support, as exemplified in the Grant for scientific research administered under the aegis of the Royal Society. Even those doughty campaigners on behalf of increased support and recognition for science, the 'X' Club, felt in 1869 that the best assistance to original research could be provided through increased official aid through this same Royal Society Government Grant.(1) Such opinions contributed to the widespread assumption that scientific research was best conducted by independent individuals, a state of affairs whose passing The Times felt called upon to lament as late as 1892: "The Professor abounds greatly, while independent investigators of the type of Joule, Brewster, Spottiswoode, De la Rue, Gassiot, Grove and others who have been the glory of English science, are completely rare".(2) It is no surprise to find that four of those mentioned here were men closely involved in the R.I. These were men who, like almost all the scientific men active in the R.I. in the middle decades of the century, remained outside the developing professional career structure of science, and were themselves the descendants of a tradition of amateur investigation. It was perhaps then not surprising that they continued to believe that individual patronage rather than official aid was the correct way to finance research, and indeed many of them were patrons themselves. So it came about that support of the Royal Institution, which paradoxically had been the first place where scientific research had been pursued within an institutional framework, came to represent a compromise between the patronage of an individual scientific genius, and the mobilisation through an institution of the larger funds required by the increasing complexity of research.

(1) 'X' Club Notebook, i. (7 Jan 1869).
(2) The Times, 1 Dec 1892, quoted in Macleod, 'The Royal Society and the Government Grant', loc.cit., p.357.

This reliance on private philanthropy and patronage underlined an ever present financial weakness in the Institution. Not surprisingly, the patron's outlook held that financial gain should be despised as derogatory to the character of the true scientist. At the same time, the R.I.'s Managers were acutely aware of the need to pay their professors adequately, in a world where one result of professionalization was increased financial reward. The period from 1850 to the mid-1870s was one of inflation, which emphasized the urgency of the problem, a problem which was inevitably aggravated by the unpredictable ups and downs of private support. The Institution clearly could not depend on being able always to find a scientific genius as selfless as Faraday for its principal professor. So financial caution also played a part in restricting the scientific activities of the Institution at a time in the 1860s when Frankland was working in the Institution, and a proper school of research might have materialised. It is worth noting too that Bence Jones hoped to persuade Huxley to accept a permanent post at the R.I. as Fullerian Professor of Physiology, rather than only a three year term, which had it so happened would have meant that three of the most notable men of science of the time would all have been working in the Institution.(1)

The Institution never solved its financial problems, a factor which contributed to its dependence on one individual, rather than on a team or a school, as the mainstay of its research effort. The Institution's approach to research was always an individualistic one, dependent primarily on one man to sustain its scientific reputation, as indeed it had done for most of its history. In this sense one may view Frankland's years at the R.I. from 1863 to 1868 as a temporary aberration, and the individualistic approach was reinforced during the five years following Frankland's departure, both by the climate of

(1) Huxley to Tyndall, May 1867, cited in L. Huxley, <u>Huxley</u>, i.292-3.

opinion as to how research should be supported, as well as by the personalities involved. Frankland's successor at the R.I. was William Odling (1829-1921), a chemist with perhaps greater talent for teaching than original research.(1) At the R.I. he produced no research work that aroused great public interest, and his lecturing style was better suited to serious students of chemistry than to the very mixed audience which attended R.I. lectures. Bence Jones finally became exasperated: "I have preached at his impossible abstract of his last lecture till I can say no more".(2) With no apparent regrets on either side, in July 1873 Odling left the R.I. shortly after his appointment as Waynflete professor of chemistry at Oxford.(3) Tyndall therefore had no rival during Odling's tenure of the professorship of chemistry, and became more important to the R.I. than ever. Furthermore, in 1868 he resigned his professorship at the Royal School of Mines, in order to give himself as much time as possible for research, and thus his scientific work became more centred than ever in the R.I. Never more popular than in the early 1870s, Tyndall exerted a charisma that blinded even close colleagues. In 1873 Spottiswoode spoke of him in unduly eulogistic terms, even allowing for the conventions of the time:

> Of Faraday's successor, John Tyndall, I am greatly at a loss how to speak. In this place his presence seems so near to us, his thoughts so subtle, his words - even when rung back to us from those busy cities far away on the other side of the Atlantic - so familiar and yet so stirring, that it behoves us that ours should be wary and few. Few men have brought so large a burden and bulk of contribution to the common stock of knowledge; but fewer still have inspired in his hearers so strong a love, such ardent enthusiasm, for the subjects of his researches.(4)

(1) For an assessment of Odling's work, see D.S.B., X.177-9.
(2) Bence Jones to Tyndall, 4th Aug 1869 (Tyndall, Correspondence, 14/F6.29).
(3) Certainly the R.I. was willing to see Odling depart, and it may even have been engineered, as both Bence Jones and W.R. Grove acted as referees for Odling's application for the Waynflete professorship (Sir B.C. Brodie, Jr. to W.R. Grove, 26 May 1972 (Grove MSS)).
(4) Spottiswoode, loc.cit., p.7.

In retrospect, it now seems clear that although Tyndall had undoubted gifts and made several significant contributions to physics and bacteriology, he does not merit inclusion in the ranks of great scientists, and was in no way the equal of Faraday. However, to his contemporaries in the early 1870s, Tyndall was outstanding. In his last years, Bence Jones felt that so long as Tyndall remained at the R.I., its future was safe, even going so far as to say "Your name and fame is of more consequence to us than any new discovery just now can be ...".(1) The other professorship was insignificant, and who should succeed Odling was unimportant: "It really matters but little whilst you reign".(2) It is however very significant that the man the Managers chose to succeed Odling was a man who certainly would not compete with Tyndall's popularity, but more important, could be relied upon to exemplify the image of the independent scientific investigator pursuing his disinterested researches. In 1874 the Managers appointed their trusty ex-colleague, John Hall Gladstone, as Professor of Chemistry. Gladstone was then a man in his mid-forties, who possessed private means and thus had that personal independence appropriate to a scientist interested only in pursuing pure knowledge, and was also less likely to be enticed away by the lure of professional advancement in Government service or academic life. As Spottiswoode said in 1873, "Our first and foremost object ... must be to find a succession of professors of the old type; men who love research".(3) The view could not be more clearly illustrated that those involved in the R.I. felt that the emergence of the professional scientist did not favour the pursuit of disinterested research, and that the research the R.I. as an institution was concerned to promote should be unhampered by any practical

(1) Bence Jones to Tyndall, 7 Jan 1873 (Tyndall, Correspondence, 14/F12.62).
(2) Ibid.
(3) Spottiswoode, loc.cit., p.9.

or worldly consideration. It is true that one other factor may also have influenced the appointment of Gladstone, and that was the desire to balance Tyndall's reputation for atheistic materialism, especially after the commotion caused by his address in 1874 to the British Association in Belfast, by appointing a man noted for his Christian apologetics. But Gladstone's brand of hearty Christianity and "breathless well-doing" exemplified in his work for the Y.M.C.A.,(1) only exacerbated Tyndall's latent dislike which soon flared into open dispute, and Gladstone was not re-appointed in 1877 when his three-year tenure was up.(2)

Scientific research at the R.I., supported as it was by private patronage, continued to have a devotee character reminiscent of the gentleman amateur, the independent investigator of former days. Nor was the other aspect of that tradition of patronage neglected, the cultivation of a wide literary learning embracing all fields of knowledge. "Science" in the old sense of the word was as much an integral part of its activities as was "science" in the modern sense of the word. So long as there was leisure enough in the lives of its patrons, the cultivation of learned interests of all kinds was possible in this unique species of literary and philosophical society. The recognition of scientific research as the Institution's prime objective in no way denied its character as a literary and philosophical society, and as has been argued above, the literary aspects of the R.I. not only were more important than has been considered hitherto, but became in the 1860s more important than ever before, and contributed in large measure to the vitality of the Institution in that decade.

(1) Binfield, <u>op.cit.</u>, p.272.
(2) See the letters between them when Tyndall thought that Gladstone accused him of interference, and took a high, angry tone; Tyndall to Gladstone, 11 and 13 Oct 1875; Gladstone to Tyndall, 12 Oct 1875 (Tyndall, Correspondence, 10/C4.3-4, 10/C2.4; Tyndall's first letter has been dated as 11 Dec 1875 in the Friday Catalogue, but this should read 11 Oct 1875).

By 1870 the R.I. had become sufficiently secure in its defined objectives and conscious enough of its identity and function to indulge in that traditional activity for an institution which had, as it were, come of age, namely, to narrate its history. This was a widespread phenomenon at this time, and many histories were written of such different types of institution as schools, chapels, regiments and learned societies. As a rule these histories tell us more about how the men who wrote them saw the institution in question, than they do about the institution's past. So it was at the R.I., and in these years new myths were made about the early years of the R.I., not least by Bence Jones himself in his history of <u>The Royal Institution: its Founders and its First Professors</u> (1871). Above all, the Institution was seen as the conscious product of its early Professors, who were men "of the old type", who loved research for itself alone. The involvement of the Institution in other activities, such as education, was always seen as subordinate to research, the chief objective. Indeed, Bence Jones and his colleagues in the early 1870s began to look back, not to the successes of the 1860s, but to a much earlier period of the R.I.'s history, and to find in Davy and the young Faraday the ideal of the research scientist they wished to support. Faraday's death in 1867 released a spate of biographies. The following year Tyndall gave an afternoon Course of nine lectures on "The discoveries of Faraday", together with two Friday Evening Discourses on the same subject, which formed the basis of his biography, <u>Faraday as a Discoverer</u> (1869). Other biographies quickly appeared by Bence Jones in 1870 and by J.H. Gladstone in 1872.(1) Nor was the scientific work of the other Professors forgotten, and their contributions to scientific knowledge were recounted in detail in Odling's Course of lectures on "Davy's

(1) Bence Jones, <u>Life and Letters of Faraday</u> (1870), 2 vols; J.H. Gladstone, <u>Michael Faraday</u> (1872).

Discoveries in Chemistry" (1871),(1) and in Spottiswoode's Discourse on "The Old and New Laboratories of the Royal Institution" (1873). Count Rumford, hitherto virtually ignored, was accorded the honour of being responsible for the foundation of the Institution itself, and in his new role of founding father naturally received considerable attention, for example, in Bence Jones' history of The Royal Institution, and in 1871 as the subject of a Discourse by W. Matthieu Williams, "On Rumford's Scientific Discoveries".(2) In 1870 Bence Jones had copied and circulated to the Members the text of the earliest proposals to establish the Institution in 1799, in which Rumford featured prominently.(3)

This recently acquired sense of history even extended to pieces of apparatus, which acquired a new status as historical objects of veneration. In 1870 a lengthy correspondence was entered in the Managers' Minutes on the acquisition of the iron ring from which Faraday first discovered an electromagnetic impulse.(4) At the same time the majority of the exhibits which had formed the old R.I. museum were given to what now evidently and significantly, seemed more suitable homes, so that for example "medieval stirrups" and "sepulchral Egyptian tablets" were handed over to the British Museum.(5) Indeed, mention of such objects exemplifies what kind of museum it was in the mid-nineteenth century - not a collection on permanent display in a room set aside for the purpose - but a miscellaneous collection of objects which it was thought

(1) Davy's chemical work was the subject of another Course of lectures not long after, by Dewar in 1877.
(2) W. Matthieu Williams (1820-1892), scientific writer (D.N.B.); P.R.I., vi (1870-72), 227-34. This renewed interest in Rumford coincided with the publication in 1870 of George E. Ellis, Memoir of Sir Benjamin Thompson, Count Rumford, published in connection with an edition of The Complete Works of Count Rumford (1870-75).
(3) Man.Min., XII.333 (9 May 1870), and P.R.I., vi (1870-72), ix-xxxii.
(4) Man.Min., XII.341, 346-7 (4 July and 7 Nov 1870); this ring had come into the possession of Sir James South, the astronomer and an old friend of Faraday. He bequeathed it to the R.I. "at the solicitation" of Bence Jones (ibid., XII.346).
(5) Ibid., XII.354-6 (6 Feb 1871), items listed in margin; see also ibid., XII.345 (7 Nov 1870).

proper for an institution such as the R.I. to possess, and to which suitable gifts could be entrusted. From 1870 however the R.I. museum began to be what it is today, that is, a collection of apparatus of historical importance, rather than a heterogeneous mixture of contemporary working devices, loan apparatus for lectures and miscellaneous curios. An early landmark in this new phase of the museum came in 1876 when R.I. apparatus was exhibited in the "Special Loan Collection of Scientific Apparatus" at the South Kensington Museum, when Tyndall lectured on Faraday's apparatus, and Gladstone spoke on that of both Davy and Faraday.(1)

So it came about that in the early 1870s the history of the R.I. was written for the first time, and written in terms that were to remain unchallenged for another century, in effect until the early 1970s. The picture then painted was an attractively simple one, portraying the R.I. as the home of a series of great research scientists whose work was made possible by virtue of the enlightened patronage of independent philanthropy. Those of its Professors who did not fit into this mould were swiftly forgotten. W.T. Brande, for example, received not a single mention in Spottiswoode's summary of scientific work done at the R.I., "The Old and New Laboratories of the Royal Institution". Forgotten too was the fact that only recently had research been numbered at all among the Institution's objectives, and that education and the diffusion of useful knowledge, as well as practical advice on the applications of science, had from the beginning occupied a major part of its energies. Ignored too, or at least minimised, was its long commitment to a Renaissance tradition of the unity of humane learning. Yet the essential attraction of the R.I. in this

(1) These lectures were subsequently published as <u>Free Evening Lectures delivered in connection with the Special Loan Collection of Scientific Apparatus, 1876</u> (1878).

period was its appeal to that ancient tradition, its appeal to the world of general learning, not to that of scientific learning alone. As science became technically more difficult and more specialised, the R.I., like all non-specialised literary and philosophical societies, had to become a populariser of science. In the 1860s and 1870s however it was the ideal of disinterested research which was held up as the operative ideal and raison d'etre of the Institution. Because this ideal had perforce to be maintained within the institutional framework of a gentleman's literary and philosophical society, the Institution's mid-nineteenth stage of evolution proved to be the decisive one in moulding its form and in defining its goals. Faraday's ideal had indeed triumphed. It was given reality through an institution that deliberately remained outside the main stream of developments in scientific organisation, but was one that continued to be productive of important discoveries. Tenacious in adherence to tradition, yet adaptable to the needs and demands of succeeding years, it saw its historic importance in those discoveries that are irresistibly linked with the names of its Professors. Disregarded then and later, was that vital purposeful era when the Institution acquired the shape it has retained ever since, in the years that were surely its golden age as an institutional organism, the decade of the 1860s.

Appendix I: Professors of the Royal Institution

A complete list of all Professors appointed up to the present day may be found in the Record of the Royal Institution (1968), pp.26-28. The list below is confined to the mid-nineteenth century.

	Professor of Chemistry	Fullerian Professor of Chemistry	Professor of Natural Philosophy	Fullerian Professor of Physiology
	(1813)	(1833)		(3 year term)
1840	W.T.Brande	M.Faraday		
1841				Thomas Rhymer Jones
1842				
1843				
1844				W.B.Carpenter
1845				
1846				
1847				
1848				W.W.Gull
1849				
1850				
1851				Thomas Wharton Jones
1852				
1853			J.Tyndall	
1854				
1855				T.H.Huxley
1856				
1857				
1858				Sir Richard Owen
1859				
1860				
1861				
1862				John Marshall
1863	E.Frankland			
1864				
1865				T.H.Huxley
1866				
1867				
1868		W.Odling (June) (Director of the Chemical Laboratory Dec 1868)		
1869				M.Foster
1870				
1871				
1872				W.Rutherford
1873				
1874		J.H.Gladstone		
		(1877)	(1887)	(1875)

Appendix II: Managers of the Royal Institution, 1840-1873

The Managers have been divided into three categories in order to distinguish between those who were frequently re-elected, those who served between three and five years, and those who were not elected more than twice during the period in question. Those who also served before 1840 are indicated by an asterisk (*). Only the briefest details are given of those appearing in the D.N.B.

i. Managers who served at least six years:

*BARLOW, Rev. John (1799-1869), Secretary from 1843 to 1860; served as a Manager until 1864 (see above, pp.35-41).

BENCE JONES, Dr. Henry (1813-1873), Secretary from 1860 to 1870 (D.N.B., and above, pp.41-3).

BOILEAU, Sir John, 1st Bt. (1794-1869), gentleman, archeologist and supporter of scientific societies (D.N.B.).

BOWMAN, Sir William (1816-1892), ophthalmic surgeon. Served as Secretary from 1882 to 1885 (D.N.B.).

BUSK, George (1807-1886), man of science. Treasurer from 1873 to 1886 (D.N.B.).

*CABBELL, Benjamin Bond (1781-1874), barrister and patron of the arts; Treasurer of the R.I. Library and Laboratory Funds (D.N.B., and above, pp.74-82).

COLE, John Griffith (d.1865). Son of Samuel Cole, senior chaplain of Greenwich Hospital. Educated Oxford; Fellow of Exeter College 1825-1839. Also belonged to the Royal Geographical Society.

DE LA RUE, Warren (1815-1889), inventor and man of science. Secretary from 1879 to 1882 (D.N.B., and above, pp.51-2, 53-6).

*DODD, George (d.1864). Magistrate and deputy-lieutenant for Middlesex. Conservative M.P. for Maidstone from 1841 to 1853. A Gentleman of the Privy Chamber 1844 to 1864.

EVEREST, Sir George (1790-1866), surveyor-general of India from 1830 to 1843; gave his name to Mount Everest (D.N.B.).

FELLOWS, Sir Charles (1799-1860), traveller and archeologist (D.N.B.).

FORBES, Sir John (1787-1861), Scottish physician; friend of Sir James Clark, and physician to the Queen's household from 1840 to 1859 (D.N.B.).

II.i.

GASSIOT, John Peter (1797-1877), man of science, wine merchant and radical utilitarian (D.N.B., and above, pp.49-50, 53-6).

GLADSTONE, John Hall (1827-1902), chemist. Fullerian Professor of Chemistry at the R.I. from 1874 to 1877 (D.N.B., and above, pp.52-3).

GOLDSMID, Aaron A~~a~~s~~c~~her (c.1785-1860), stock agent. Probably related to the Goldsmid family of financiers and philanthropists.

GROVE, Sir William Robert (1811-1896), judge and man of science (D.N.B., and above, p.51).

HAWKINS, Caesar Henry (1798-1884), surgeon to St. George's Hospital from 1829 to 1861 (D.N.B.).

*HELLYER, William Varlo (born c. May 1787), equity draftsman and conveyancer. Son of John Hellyer, formerly of Porchester, Hants. Did not go to Oxford or Cambridge, but admitted to Lincoln's Inn in November 1819, aged thirty-one. Called to the bar in 1825, and was still practising in the mid-1860s. Joined the R.I. in 1828; Secretary to the Patrons of the Library and an active opponent of managerial control (see above, p.78).

*HOLLAND, Charles (1802-1876), physician to the Islington Dispensary, and formerly President of the Royal Medical Society of Edinburgh. F.R.S. (1837).

HOLLAND, Sir Henry, 1st Bt. (1788-1873), physician. President of the R.I. from 1865 to 1873 (D.N.B., and above, pp.31-3).

LUBBOCK, Sir John, 3rd Bt. and 1st Lord AVEBURY (1834-1914), man of science, banker and Member of Parliament (D.N.B.).

MACILWAIN, George (1797-1882), surgeon and medical writer (D.N.B.).

*MOORE, George (c.1777-1859), architect. Surveyor to the Skinners' Company. An original member of the Royal Institute of British Architects. Also a Fellow of the Royal Society and the Antiquaries.

*MURCHISON, Sir Roderick Impey (1792-1871), geologist. Director-General of the Geological Survey from 1855 to his death (D.N.B.).

*PILGRIM, C.H. Auditor to the New River Co., Sadlers Wells. A Fellow of the Society of Antiquaries. By 1850 had moved out of London, and lived in a number of different places in southern England.

*POLE, William (1798-1884), equity draftsman and conveyancer. Second son of Charles Van Notten Pole, of Wyck Hill House, Glos. Educated Eton and Oxford. Admitted to Middle Temple in 1818, and called to the bar in 1823. Treasurer of the R.I. from 1849 to 1865; continued to serve as a Manager until 1878 (see above, pp.33-4).

POLLOCK, Sir William Frederick, 2nd Bt. (1815-1888), barrister and man of letters (D.N.B.).

POWELL, Lewis (1796-1867), physician. Born in Trecastle, south Wales. Educated at St. George's Hospital; M.D. Edinburgh 1823, and published De Rheumatismo (Edinburgh) in the same year. From 1837 practised in London; connected with St. George's Hospital, where he instituted the Lewis Powell Clinical Prize in Medicine, and the Lewis Powell ward is named after him.

ROUPELL, Robert P. (1797-1886), Q.C. and bencher of Lincoln's Inn. From a family of minor gentry from Charlton, Kent. Educated Cambridge and called to the bar in 1822. Took silk in 1842; led in the Rolls Court until retirement. Collected old master sketches and rare books, especially early French poems and romans.

*SABINE, General Sir Edward (1788-1883), man of science. Chief work in astronomy and geography; President of the Royal Society from 1861 to 1871 (D.N.B.).

THRUPP, Joseph William (1799-1873), solicitor. His son, Joseph Francis (1827-1867), achieved some note as a member of the board of theological studies, Cambridge, and author of works on the Bible and the history of Jerusalem.

WEBSTER, John (1794-1876), physician. Son of a Scottish minister. Studied in Edinburgh, and in London at the Great Windmill Street School and St. George's. Spent a further year each in Paris, Italy and Berlin. Travelled widely studying lunatic asylums, prisons and medical institutions, on which he published several books. F.R.S. (1844).

WENSLEYDALE, Sir James Parke, 1st Baron (1782-1868), judge (D.N.B.).

WHEATSTONE, Sir Charles (1802-1875), inventor and Professor of Experimental Philosophy at King's College, London (D.N.B. and above, pp.51, 55).

YORKE, Colonel Philip James (1799-1874), man of science and President of the Chemical Society 1853-1855 (D.N.B. and above, pp.50-1).

ii. Managers who served between three and five years:

ASHBURTON, William Bingham Baring, 2nd Baron (1799-1864), politician and educationist (D.N.B.).

BERKELEY, George (1821-1893), civil engineer. Assistant to Robert Stephenson from 1841-49, and acted as Stephenson's representative on the Great Indian Peninsular Railway from 1851-59. Consulting engineer to the Colonial Office for railways and other works in southern Africa from 1874-85. President of the Institution of Civil Engineers 1891-92, and knighted in 1893. Frequently elected a Manager from 1869.

BIGSBY, John Jeremiah (1792-1881), physician ~~surgeon~~ and geologist (D.N.B.).

BIRD, William Wilberforce (1784-1857), East India Company official. Distinguished career in India until he retired to England in 1844. Helped to abolish the practise of suttee and to suppress slavery.

BLAAUW, William Henry (1783-1870), antiquary. Son of an original proprietor of the R.I. (D.N.B.).

*BOURNE, William Sturges (1769-1845), politician (D.N.B.).

BRODIE, Sir Benjamin Collins, 1st Bt. (1783-1862), surgeon. President of the Royal Society from 1858 to 1861 (D.N.B.).

BROOKE, Charles (1804-1879), surgeon and inventor of meteorological instruments (D.N.B.).

CARDALE, John Bate (1802-1877), wealthy solicitor and founder of the "Catholic Apostolic Church", popularly known as the Irvingite church (D.N.B.).

CODRINGTON, Admiral Sir Edward (1770-1851). Commanded the fleet at the victory of Navarino in 1827 (D.N.B.).

CODRINGTON, Admiral Sir Henry John (1808-1877). Son of the preceding. Appointed Admiral of the Fleet in 1877 (D.N.B.).

DAVIDSON, Thomas. Not identified. Joined the R.I. in 1832 and was still a Member in 1870.

GALTON, Sir Douglas Strutt (1822-1899), man of science and civil servant. Active in railway, sanitary and educational questions (D.N.B.).

GILLETT, William Stedman (born c.1801). Son of Gabriel Gillett, a London merchant. Educated Oxford and admitted to Inner Temple. Does not appear to have practised law. Took out various patents for mechanical devices and was a supporter of the Royal College of Chemistry (1845). Joined the R.I. in 1838; by 1860 had moved to Southampton.

HAMILTON, Sir Charles, 2nd Bt. (1810-1892). In the Army until 1854. Commanded a battalion at the battle of Alma, and sold out of the Army shortly after. Left a fortune of £188,000.

*LONG, George (1780-1868), lawyer. Police magistrate 1841-1859; wrote various legal works (D.N.B.).

MATHEWS, Wilkinson (1784-1866), Q.C. and bencher of Lincoln's Inn. Son of a Yorkshire solicitor. Educated Cambridge and called to the bar in 1810. From 1818 to 1830 a Charity Commissioner. Treasurer of Lincoln's Inn in 1859; highly esteemed in his profession.

MOORE, John Carrick (1805-1898), gentleman geologist. Son of an eminent surgeon and nephew of Sir John Moore of Corunna. Owned estates in Scotland and England. Studied the rocks of Wigtownshire and discovered graptolites; wrote several papers on fossils and stratified rocks. An active member of the Geological Society and its secretary from 1846 to 1852.

NORTHUMBERLAND, Algernon George Percy, 6th Duke, formerly styled Lord LOVAINE (1810-1899). Succeeded to the dukedom in 1867. President of the R.I. from 1873 to his death. Also President of the Royal National Life-boat Institution, and a vice-president of the Royal Society of Literature. Very wealthy; in 1874 sold his London residence to the Metropolitan Board of Works for just under £½m.

*PEPYS, William Haseldine (1775-1856), man of science. An original proprietor of the R.I., and also of the London Institution (D.N.B.).

WALFORD, Weston Styleman, lawyer. Fourth son of William Walford, formerly of Stoke, Suffolk. Admitted to Middle Temple in 1823, called to the bar in 1829. Sided with the Library Patrons against the Managers (see above, p.76). Also a Fellow of the Society of Antiquaries.

iii. Managers who served one or two years only

ACLAND, Sir Peregrine Fuller Palmer, 2nd Bt. (1789-1871). Succeeded to the baronetcy in 1831, which became extinct on his death.

APPOLD, John George (1800-1865), inventor of mechanical devices. Active manager of the London Institution (D.N.B.).

ARGYLL, John Campbell, 7th Duke (1777-1847). Whig M.P., 1799 to 1820. Succeeded to the dukedom in 1839. "Attached to scientific pursuits, and was well acquainted with the principles of chemistry and mechanics" (Gentleman's Magazine, ii (1847), 81), interests for which his son, the 8th Duke, is better known.

ARMSTRONG, Sir William George (1810-1900), inventor and industrialist (D.N.B.).

ATKINSON, Sir Jasper (1790-1856), colleague of Brande at the Mint. Son of H.W. Atkinson, Provost of the Company of Moneyers, to which position he succeeded in 1848, until the Company was dissolved in 1851. Knighted in 1842 for services to the Ottoman, Russian and French governments.

AYLMER, Matthew Whitworth, 5th Baron (1775-1850), general. Governor-General of Canada from 1831 to 1835.

*BAYLEY, William Butterworth (1782-1860), director of the East India Company. Chairman of the Court in 1840 (D.N.B.).

*BELLASIS, Edward (1806-1873), lawyer. Employed in Parliamentary practice from 1836 to 1866 (D.N.B.).

BLAKE, Henry Wollaston (1815-1899), civil engineer. Educated Eton and Cambridge. Carried out many works abroad. A director of the Bank of England from 1853 to his death. F.R.S. (1843).

BRANDE, William Thomas (1788-1866), Professor of Chemistry, R.I., 1813 to 1852. Elected a Manager in 1852 immediately following his resignation from the professorship (D.N.B.).

*BRISCOE, John Ivatt (1791-1870). Educated Oxford and Lincoln's Inn, but not called to the bar. In 1824 wrote two pamphlets on prison discipline. Liberal M.P. for various Surrey constituencies from 1830 to 1870.

CARDWELL, Edward, 1st Viscount (1813-1886), statesman. Attended only two Managers' Meetings (D.N.B.).

DAWSON-DAMER, Colonel G.L. (1788-1856). Third son of 1st Earl Portarlington. In the Army until sold out in 1833. Conservative M.P. from 1835 to 1852. Comptroller of the Royal Household, 1841 to 1846. Assumed the name Damer in 1829 when inherited large estates in Dorset from an aunt.

De MAULEY, William Ponsonby, 1st Baron (1787-1855). Third son of 3rd Earl Bessborough. Whig M.P. for various constituencies from 1826 to 1837; created baron in 1838. Acquired large estates in Dorset by marriage to heiress of Earl of Shaftesbury.

DENISON, Edmund Beckett, 1st Lord GRIMTHORPE (1816-1905), lawyer, mechanician and controversalist (D.N.B.).

*DEVONSHIRE, William Cavendish, 7th Duke (1808-1891). A Manager of the R.I. three times in the 1830s and in 1841, when styled 2nd Earl of BURLINGTON. Chairman of the Royal Commission on Scientific Instruction and the Advancement of Science (D.N.B.).

DERBY, Edward Henry Stanley, 15th Earl (1826-1893). Son of the leader of the Conservative Party. Held many political posts. Elected a Manager twice in the 1860s as Lord STANLEY, before succeeding to the earldom in 1869 (D.N.B.).

DUCIE, Henry John, 3rd Earl (1827-1921). Owned estates in Gloucestershire. Lord Warden of the Stannaries, and a member of the Prince of Wales' Council, 1888-1908.

ERLE, Sir William (1792-1880), judge. Authority on trades' unions (D.N.B.).

FARRER, James William (1785-1863), barrister. A Master in Chancery from 1824 to 1852, when that office abolished. For many years a Visitor of the R.I.

FARRER, Oliver (1786-1866), solicitor. Brother of the preceding, with whom he jointly owned an estate in Yorkshire. Director of the Law Life Assurance Society and of several joint-stock banks.

GAGE, Henry Hall, 4th Viscount (1791-1877). Distinguished as the longest sitting peer in the House of Lords, where he sat for 69 years. Gave a Friday Evening Discourse at the R.I. in 1844 "On the Principles and Application of the Sliding Rule".

*GROVER, Captain John (1794-1848). A lieutenant in the East Suffolk Foot until 1826, when promoted to captain and put on half-pay. Wrote two pamphlets on Afghan affairs. F.R.S. (1830).

*HALLAM, Henry (1777-1859), historian. A founder of the Statistical Society, and active in the Society of Antiquaries (D.N.B.).

HARCOURT, Colonel Francis Vernon (1808-1880). Ninth son of Edward Harcourt, Archbishop of York. Entered the army in 1820, and retired on half-pay in 1840. Conservative M.P. for Isle of Wight 1852 to 1857. A magistrate and deputy-lieutenant of Hampshire.

JENNINGS, Richard (1814-1891). Educated Cambridge; called to the bar in 1838, but does not appear to have practised. Owned an estate in Carmarthenshire, of which he was High Sheriff in 1859. Wrote two books on political economy.

KATER, Edward (d.1866). Youngest son of Henry Kater (1777-1835), man of science. Made some improvements to his father's scientific instruments. F.R.S. (1840). Interested in photography, and a member of the 'Calotype Club' in 1847.

LEMON, Sir Charles, 2nd Bt. (1784-1868), Cornish landowner. Represented various Cornish constituencies in Parliament from 1807 to 1857. A noted supporter of Cornish scientific societies; a founder of the Statistical Society. Also owned mines, and was much involved in mine affairs, especially in Cornwall.

LIMOND, Lt.Colonel Thomas Kennedy (died c.1849), formerly of the Madras Cavalry. Retired in 1840.

LINDSAY, John Trotter, 10th Earl (1827-1894). In the army from 1843 until 1851, when he succeeded to the earldom. From 1885 to 1894 a representative peer for Scotland.

LONDESBOROUGH, Albert Denison, 1st Baron (1805-1860), wealthy Yorkshire landowner and archeologist (D.N.B.).

MACAULAY, Thomas Babington, 1st Baron (1800-1859), historian (D.N.B.).

MORISON, General Sir William (d.1851). Served in India from 1800 to 1840, where his posts included the charge of the geographical and statistical survey of Madras. A member of the Supreme Council from 1834 to 1837. Returned to England in 1840; M.P. for a Scottish constituency from 1842 to 1851. F.R.S. (1842). Knighted in 1848.

MAITLAND, Rev. Samuel Roffey (1792-1866), historian and miscellaneous writer. Librarian at Lambeth Palace from 1838 to 1848 (D.N.B.).

*MOSLEY, Sir Oswald, 2nd Bt. (1785-1871). From an old Cheshire family. Wrote on archeology and natural history. In 1845 sold the manorial rights of Manchester to the corporation for £200,000. Left over £350,000.

NASMYTH, James (1808-1890), engineer. Invented the steam hammer and made many improvements in machine tools; also interested in astronomy (D.N.B.).

NORTHAMPTON, Spencer Compton, 2nd Marquis (1790-1851). Supporter of various scientific societies; President of the Royal Society, 1838-1849. Also published verses (D.N.B.).

OVERSTONE, Samuel Jones Loyd, 1st Baron (1796-1883), banker and landowner. Authority on banking and finance (D.N.B.).

PARIS, Dr. John Ayrton (1785-1856), physician. President of the Royal College of Physicians from 1844 to 1856. Wrote a life of Sir Humphrey Davy in 1831 (D.N.B.).

PERCY, John (1817-1889), metallurgist. Professor of metallurgy at the Royal School of Mines from 1851 to 1879. Also collected antiquarian books, mostly on science (D.N.B.).

PHILIPS, Sir George, 2nd Bt. (1789-1883). Whig M.P. for various constituencies from 1820 to 1852. Owned an estate in Warwickshire.

POLLOCK, General Sir George, 1st Bt. (1786-1872), distinguished soldier. Uncle to W.F. Pollock (D.N.B.).

RENNIE, James (1806-1883), civil engineer. Younger brother of Sir John and George Rennie, and with them continued their father's undertakings. F.R.S. (1845).

RAYLEIGH, John William Strutt, 3rd Baron (1842-1919), physicist. From 1873 frequently elected a Manager. Professor of Natural Philosophy at the R.I. from 1887 to 1905 (D.N.B.).

RUDGE, Edward John (1792-1861), antiquary. Son of Edward Rudge (1763-1846), botanist and antiquary. Related by marriage to William Pole, R.I. Treasurer (D.N.B.).

ROSSE, Sir Laurence Parsons, 4th Earl (1840-1908), astronomer. Divided his time between managing his Irish estates and the study of astrophysics (D.N.B.).

SALISBURY, Robert Cecil, 3rd Marquis (1830-1903), statesman. Scientific interests included chemistry, electricity and photography (D.N.B.).

SIEMENS, Sir William (1823-1883), metallurgist and industrialist. Frequently elected a Manager from 1872 (D.N.B.).

SMITH, George Stavely (born c.1799). Educated Eton and Oxford. Became a Patron of the R.I. Library in 1827, and "Honorary Librarian" in 1828. Was still living in 1870. Not further identified.

SOMERSET, Edward Adolphus Seymour, 12th Duke (1804-1885). Son of 11th Duke, President of the R.I. from 1827 to 1842. Held various political posts (D.N.B.).

SOTHEBY, Major F.S., Royal Artillery. Not further identified.

STANHOPE, Philip Henry, 5th Earl (1805-1875), historian. Helped to found the National Portrait Gallery and the Historical Manuscripts Commission. President of the Society of Antiquaries, 1846-1875 (D.N.B.).

TAYLOR, Alfred Swaine (1806-1880), medical jurist. Professor of medical jurisprudence and lecturer in chemistry at Guy's Hospital (D.N.B.).

TAYLOR, Rev. William (died c.1869). Came from, or lived in, York. Wrote several books on the education of the blind, notably Diagrams of Euclid for the Use of the Blind. In 1853 gave a Discourse at the R.I., "Observations on different Modes of Educating the Blind". F.R.S. (1836); also a fellow of the Astronomical Society.

WELLINGTON, Arthur Wellesley, 2nd Duke (1807-1884), styled Marquis of DOURO until he succeeded to the Dukedom in 1852. M.P. for Norwich from 1837 to 1852. Master of the Horse 1853 to 1858.

WESTMINSTER, Robert Grosvenor, 2nd Marquis (1767-1845). Laid out Belgravia; had a well known picture collection. Did not attend any Managers' Meetings (D.N.B.).

WHARNCLIFFE, John Stuart-Wortley, 2nd Baron (1801-1855). M.P. 1823-1832 and 1841-1845. Wrote pamphlets and an economic work (D.N.B.).

WILLES, Sir James Shaw (1814-1872), judge. Member of several commissions on common law (D.N.B.).

YOUNG, George William. Not identified. No longer an R.I. Member by 1850.

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1842-1865 (Friday Evening Discourses)
1841-1912 (Laboratory and afternoon lectures)
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c) Correspondence, Notebooks and Accounts

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Folder 160, Fincher case papers.
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'Report of the Sub-Committee on Lectures', 3rd July 1922.

e) Faraday MSS

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Notebook (10), 'List of Friday Evening Discourses, Feb 1826-June 1836 by Faraday and others. List of Exhibits at each'.
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Notebook (61), notes for Friday Evening Discourses, 1838-1862.
Notebook (63), 'Repairs &c.', 1852-1863.

f) Tyndall MSS

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Correspondence, 9 boxes, containing some 6,250 letters.
Journals of Thomas Archer Hirst, 5 vols., 1847-1892.
'X' Club Notebooks, 2 vols., 1864-1891.

g) Grove MSS

Correspondence, 3 boxes, containing approximately 800 letters, arranged in alphabetical order of writer.

h) House of the Royal Institution and the Faraday Museum

Print of deputation to Faraday, offering him the Presidency of the Royal Society in 1857.
Two watercolours of Faraday working in the laboratory, 1851, by Harriet Moore.
Drawing of a Friday Evening Discourse, c.1861, by Harry Furniss (original of a Punch cartoon).

2. The Institution of Electrical Engineers

Faraday MSS.

3. The Guildhall Library, London

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SL50/2 A Collection of syllabuses of lecture courses at the Institution, 1845-55.

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Bibliographical note on the R.I. MSS

Some comment seems called for on each category of the sources listed in section A.I(1) above, especially in view of the fact that the manuscript collections of the R.I. have recently been subject to some rearrangement since the construction of a new archive room and vault.

1(a) There is a complete run of the Managers', Visitors' and General Monthly Minute books from the foundation of the Institution. The series of draft Managers' minute books only start in 1848, but for the year immediately following, they provide much valuable evidence, since notes and letters were pasted in, and alterations made to the wording, sometimes in different hands which can be identified. From the early 1850s, however, Vincent's drafts rarely received more than minor corrections by Barlow, and their usefulness diminishes as they too became formalised.

1(b) The discovery in 1846 of frauds by the assistant-secretary, Joseph Fincher, led to changes in the way records were kept of Members' subscriptions and tickets sold for lectures, as this was one area where Fincher falsified the books. The volumes containing these details may be considered reliable after that time. Before 1846 the evidence is incomplete, although the volume 'Elected Members' (1821-1845) contains details of new Members, and two small notebooks contain details of tickets bought for Courses of lectures 1826 to 1841 (probably incomplete). Between 1841 and 1846, subscribers to lectures were listed in the Managers' Minutes, but again these are incomplete. From 1830 there is a complete run of Membership Lists, excepting only those for 1842 and 1865. Two pages from the 1832 List are missing, and one page from the 1839 List, but a complete 1839 List may be found in Guard Book i. The Lists are annotated by hand and corrected ready for printing the following year. A card index of all lectures given at the R.I. from 1829 to 1900 has recently been prepared by Mrs. Milton of the R.I., giving brief details of speaker, subject, date and attendance figure. This index has not been used in the present work, but now forms an easy source for quick reference.

1(c) Most of the old box files of correspondence and institutional papers have been broken up; the old box number has been retained, although its contents may now be divided between two boxes, which explains why material relevant to the mid-century is to be found in some fourteen boxes, although only a smaller number of box numbers are cited in the footnotes. Letters from individuals are contained in folders under the name of the writer, except where the old folder has remained unchanged, as in Box XIV.142, 'Letters from Lecturers'. Letters from individuals which once formed the letter-books referred to in the Managers' Minutes, were long ago broken up, possibly even by Bence Jones, whose collection of papers (at present in Messrs. Sotheby's hands) contains letters which refer solely to institutional matters, as well as letters that he removed from the Institution in order to write his history of the R.I. and his life of Faraday.

1(d) The Guard Books contain a number of different items; those referred to in the text have been listed individually. At present Volume iii is temporarily labelled Volume iv, but as this is to be corrected, the original labelling has been retained throughout this study. The Annual Reports throughout the period under discussion may be found in the General Monthly Meeting and the Visitors' Minutes, as well as in the Guard Books, and from 1849 in the bound volumes of Membership Lists. Lists of Discourses, afternoon Courses of lectures, Presents received and, from 1863, Donations to the Fund for Experimental Research, may be found in the Guard Books, or from 1850 in the Membership Lists. Otherwise the Guard Books contain chiefly syllabuses for lectures, and from the early 1860s, printed notes for Courses of lectures prepared for the guidance of the audience. These notes are often the only source on what the lectures were about, but only Tyndall and some other lecturers, generally scientists, prepared such notes. The ticket book labelled 'Subscribers to separate Courses of lectures', 1832-1843, contains what appear to be counterfoils of tickets bought for lectures.

1(e) It should be noted that almost all of the Faraday correspondence held in the R.I. has been published, either in Bence Jones, Faraday, or Professor L. Pearce Williams, Selected Correspondence.

1(f) A version of Tyndall's Journals running to three typewritten volumes was prepared under the direction of his widow. This excised anything suggesting Tyndall was an atheistic materialist, and, if Tyndall himself erased a passage, this was not reproduced in the typescript. Pages have been cut out of the original journals. Reference has only been made to the originals, not to the typescript. Tyndall's widow also had typescript copies made of Tyndall's correspondence and of the Journals of Thomas Archer Hirst. For a guide to these MSS, see the microfiche catalogue and introduction by Friday, Macleod and Shepherd, listed above, p.309.

1(g) The Grove MSS contain letters from almost every notable man of science of the mid-century, as well as from politicians, lawyers, doctors, school-masters and so forth. They present a rich fabric of detail on the world of science, and on the influence that Grove wielded, but contain relatively few details concerning R.I. affairs.

1(h) A catalogue has recently been made of all portraits, prints, busts, medallions, etc. in the Royal Institution. There is also an important collection of early apparatus used by the Professors of the Institution, and a reconstruction in the Faraday Museum of Faraday's magnetic laboratory as it was in the mid-nineteenth century.